

Scapa Flow Scale Test Site Gravity Base Anchors:

Marine Licence Application – Supporting Document

December 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.

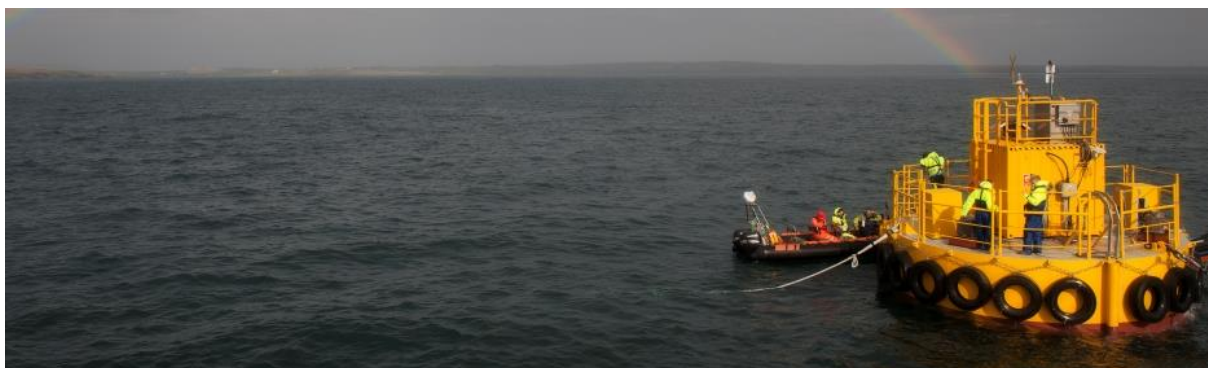


Figure 1. EMEC's test support buoy

This document has been developed to support a marine licence application, under the Marine (Scotland) Act 2010, for the continued deployment and removal of the gravity base anchors at the test site. This licence will also cover the deployment and removal of an additional gravity base anchor which will be a temporary deployment.

2 Site description

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

2.1 Scapa Flow wave test site

The site in Scapa Flow, to the south of Kirkwall, was chosen for its relatively benign waters which have 0.5m significant wave height with a predominantly westerly wave regime. The site has water depths of between 21m-25m and is situated in an area of approximately 0.4km across by 0.9km in length.

2.1.1 Location

The scale wave test site is situated adjacent to Orkney Mainland near St Mary's, within Scapa Flow. Table 1 provides the coordinates of the boundary corners of the site.

Table 1. Boundary coordinates (WGS 84) for Scapa Flow scale test site

Test Site	Corner 1	Corner 2	Corner 3	Corner 4
Scapa Flow	58° 53.950'N 002° 56.500'W	58° 53.170'N 002° 56.500'W	58° 53.170'N 002° 57.500'W	58° 53.950'N 002° 57.500'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 and the deployment of an additional gravity base anchor within the boundaries of this area.

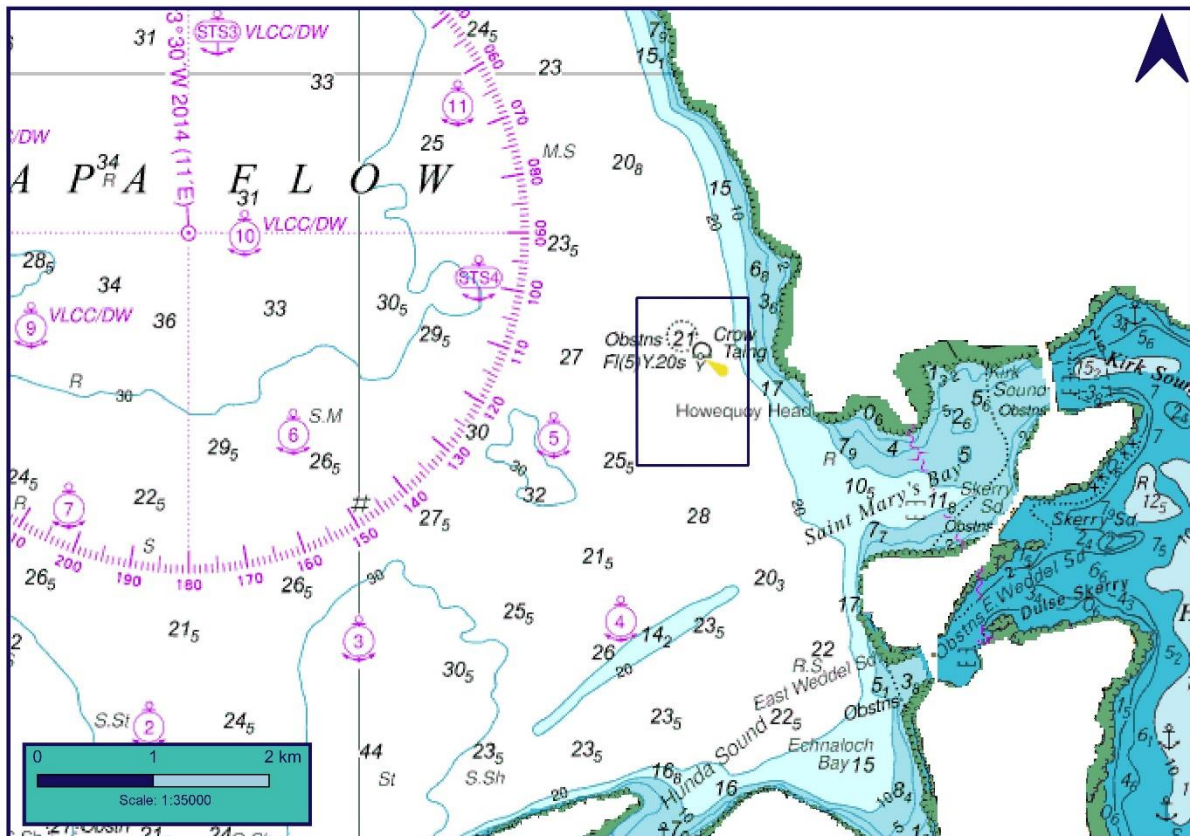


Figure 2. Scapa Flow scale test site (marked in dark blue)

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

Figure 3 shows the proposed marine licence boundary outlined in red and the site boundary outlined in blue.

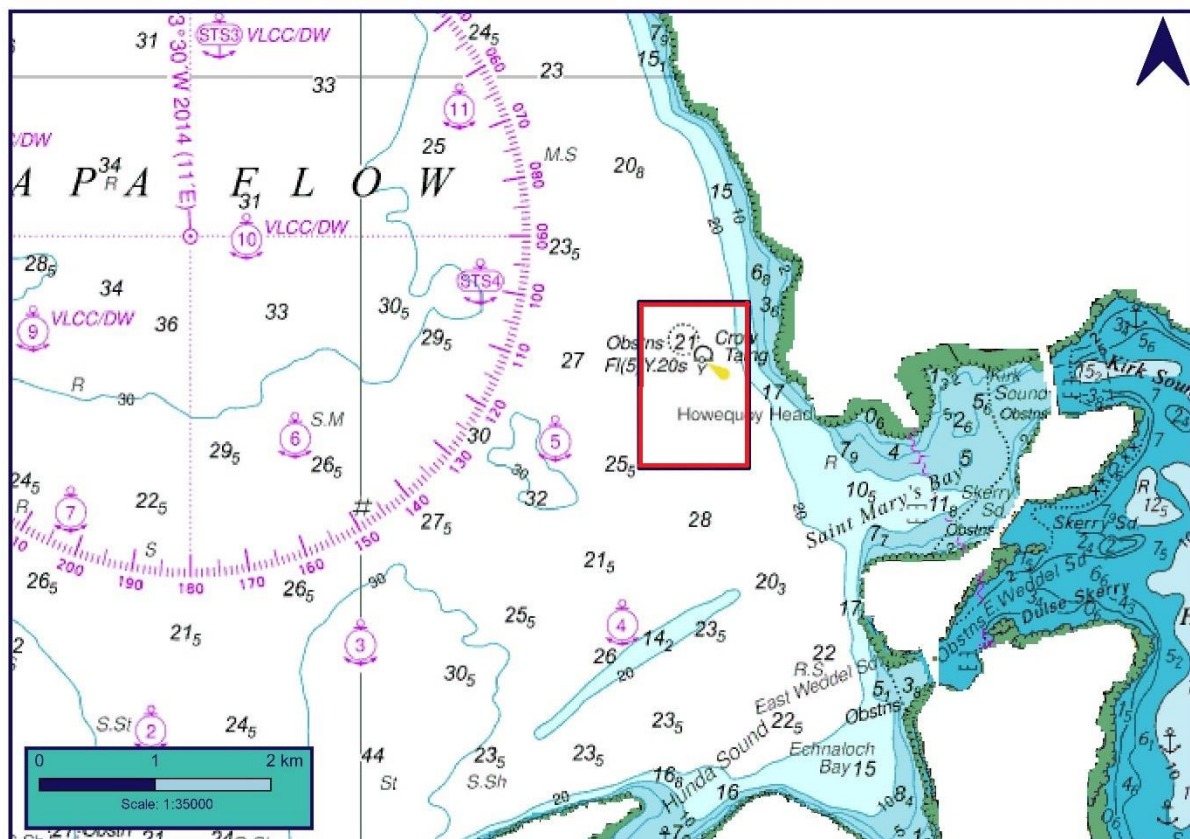


Figure 3. Proposed marine licence boundary (marked in red)

2.3.1 Gravity base anchors

Within the Scapa Flow scale test site is five pre-laid foundations with attachment points, otherwise known as gravity based anchors (GBAs). The GBAs comprise 5m x 5m x 2m gravity-based frames loaded with densecrete blocks. The GBAs have been designed and have been utilised to date for equipment, device and infrastructure moorings. They were originally installed at the site with the intention of acting as a ready-to-use berth for device and technology installations that are focusing on device/technology development rather than the seabed attachment mechanisms. However, the number of GBAs utilised and the attachment mechanisms has varied across users.

Each GBA has four attachment points with 100mm diameter holes to take shackles for the attachment of device mooring lines. Marine energy test devices can connect to four of the GBAs or potentially all five, should the test support buoy not be required. EMEC's test support buoy is typically moored from three of the GBAs.

The location of each of the GBAs currently deployed at Scapa Flow is outlined in Table 2.

Table 2. Coordinate locations for the deployed gravity based anchors at Scapa Flow

WGS84 Mooring Points	Latitude - North		Longitude - West	
	Degrees	Decimal Min	Degrees	Decimal Min
A	58°	53.829'	002°	57.001'
B	58°	53.711'	002°	56.900'
C	58°	53.658'	002°	57.127'
D	58°	53.775'	002°	57.229'
J	58°	53.881'	002°	57.183'

2.4 Deployment

This marine licence will cover the deployment of a temporary GBA that will be positioned within 100m of the TSB to allow testing of novel mooring designs.

2.5 Maintenance schedule

There are various works that may require to be undertaken to ensure the GBAs are maintained in an operable condition. Visual inspections of the infrastructure will be undertaken via drop-cam, ROV survey or a dive survey on a 2-3 year basis. Visual inspection surveys will be undertaken as and when vessels are available and weather conditions are favourable. Depending on other activities that are happening on the site, EMEC will look to conduct simultaneous works in an attempt to reduce the level of vessel traffic onsite.

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

2.6 Removal and decommissioning

There are no plans to remove the five currently deployed gravity based anchors (A, B, C, D, and J) within the lifetime of this licence. However, this licence will still cover the removal of the GBAs if required. This licence will also cover the removal of the temporary GBA that will be installed to test novel mooring designs.

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/>). This section will discuss the impact of the TSB and GBA, however this document will be submitted in support of the GBA marine licence application.

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.

Surrounded almost entirely by land, Scapa Flow forms a shallow, natural harbour with numerous inlets and bays. It is a relatively shallow inland sea which exhibits a pronounced shelf. Water depths across the test site range from approximately 15m to 30m but are predominantly between 21m and 25m. The seabed sediments and communities within the Scapa Flow test site were the subject of a number of site surveys, as part of the site selection process. EMEC commissioned both geophysical surveys (Netsurvey Ltd, 2010) and environmental sampling that included the collection of grab samples across the site aimed at determining biota and sediment particle size (Biotikos, 2010). A sand wave lying WSW-ENE across the southern section of the area was found to rise up to a depth of 14.8m (Netsurvey Ltd, 2010). The survey also identified a number of contacts across the area which are assumed to be boulders or rocks. The sample survey indicated a moderately low energy site that is characterised by stable sands of quite fine consistency (Biotikos, 2010). The habitat could be broadly classified as 'Sheltered Muddy Gravels' and subcategorised as 'Subtidal Mixed Sediments'.

The site's energy resources have been assessed using surface-mounted waverider buoys with integral downward pointing ADCP for measuring currents. Multibeam sonar, sub-bottom profiling and magnetometer surveys have also been completed (Netsurvey Ltd, 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). Observations were carried out from a single elevated vantage point at Howequoy Head, St Mary's; a total of 534 hours of observations were captured (EMEC, 2013b). 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.

Table 3. Marine mammal species counts at the Scapa Flow site for the period June 2010 - March 2013 (summer: April - September and winter: October - March) (EMEC, 2013b)

SEALS	Summer	Winter	Total
Harbour seal	24	88	112
Grey seal	79	46	125
Unidentified seal	51	114	165
CETACEANS & OTHER	Summer	Winter	Total
Harbour porpoise	48	24	72
Minke whale	0	0	0
White-sided dolphin	0	0	0
Risso's dolphin	4	5	9
Orca	3	0	3
Unidentified cetacean	0	1	1
Basking shark	0	0	0
Otter (European)	0	0	0

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 4. Bird species counts at the Scapa Flow site for the period June 2010 - March 2013 (summer: April - September and winter: October - March) (EMEC, 2013b)

BIRDS	Summer	Winter	Total
Arctic skua	7	0	7
Arctic tern	337	0	337
Auk	1	0	1
Black guillemot	4300	1288	5588
Black scoter	21	12	33

Black-throated diver	94	437	531
Common guillemot	2531	695	3226
Common scoter	0	0	0
Common tern	9	0	9
Cormorant	1	3	4
Diver sp.	0	0	0
Eider duck	1854	2581	4435
Eurasian wigeon	20	256	276
Fulmar	1292	746	2038
Gannet	1371	656	2027
Goldeneye	0	21	21
Goosander	0	0	0
Great black-backed gull	280	190	470
Great northern diver	1309	3729	5038
Great skua	376	0	376
Greylag goose	1120	573	1693
Grey phalarope	0	4	4
Herring gull	69	148	217
Iceland gull	0	1	1
Kittiwake	145	102	247
Leach's storm petrel	1	0	1
Little auk	0	57	57
Little grebe	0	1	1
Long-tailed duck	795	1310	2105
Mallard duck	2	2	4
Manx shearwater	7	0	7
Mew gull	64	1838	1902
Phalacrocorax spp.	0	0	0
Pink-footed goose	0	1	1
Puffin	130	14	144
Razorbill	579	71	650
Red-breasted merganser	106	205	311
Red-necked grebe	3	34	37
Red-throated diver	170	60	230
Sandwich tern	10	0	10
Shag	3117	1829	4946
Slavonian grebe	43	1125	1168
Storm petrel	54	4	58
Velvet scoter	97	129	226
Yellow-billed diver	2	0	2
Unidentified auk	1630	693	2323
Unidentified diver	5	11	16
Unidentified grebe	0	1	1

Unidentified gull	210	80	290
Unidentified tern	96	0	96
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 Scapa Flow 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 minutus*, 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 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

Marine Scotland collected video and photographic stills imagery from this area of Scapa Flow as part of a wider marine survey programme requested by Scottish Government. This information has subsequently been reviewed by Scottish Natural Heritage (Moore, 2009) to provide a description of the seabed habitats, species assemblages and biotopes. The study found that the site was composed of flat muddy sand seabed covered with a patchy mat of loose-lying red algae, consisting principally of the red seaweed *Phyllophora crispa* and occasional balls of *Trailliella*, a life phase of the red algae *Bonnemaisionia hamifera*. The biotope classification is namely SS.SMP.KSwSS.Pcri. Moore (2009) also reported that the infauna observed included sparse occurrences of the sand mason *Lanice conchilega*, the tube anemone *Cerianthis lloydii* and terebellid worms. Epifauna included occasional harbour crab *Liocarcinus depurator*, queen scallop *Aequipecten opercularis* and the common starfish *Asterias rubens*.



Figure 4. Seabed image within Scapa Flow test site showing flat muddy sand and loose algae (Site SF/1; Moore, 2009)

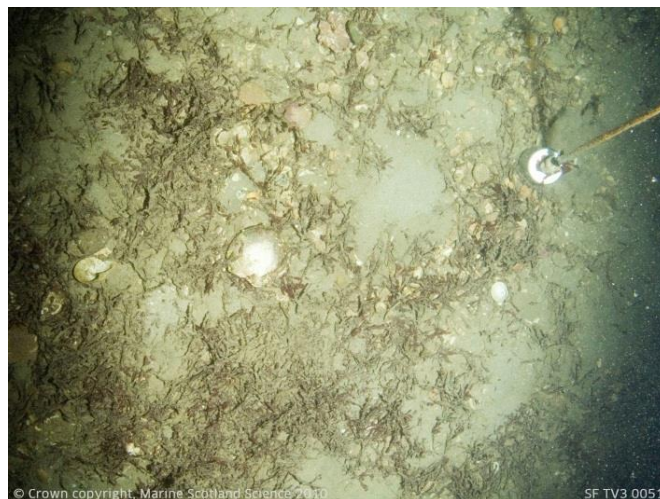


Figure 5. Seabed image within Scapa Flow test site showing flat muddy sand, pebbles and loose algae (Site SF/3; Moore 2009)

3.6 Conservation areas

The Scapa Flow waters attract some of the largest Scottish marine bird concentrations due to the numerous inlets and bays that provide a sheltered area in which birds can moult, roost, rest and feed. Over 20% of the British great northern diver population, 10% of black-throated divers and the largest concentration of Slavonian grebe in Britain winter in Scapa Flow. In summer, Scapa Flow provides important feeding grounds for breeding red-throated divers. The varied habitats and numerous wrecks support a wide diversity of fish and invertebrates (such as marine worms and shellfish), upon which the birds feed. Divers, grebes, shags and sea duck feed by surface diving. These rich waters provide excellent foraging habitat for both non-breeding and breeding birds.

The Scapa Flow test site is within a proposed Special Protection Area (Orkney Inshore Waters pSPA, previously the Scapa Flow pSPA) due to its qualifying bird species, as listed in Table 5.



Figure 6. Boundary of Scapa Flow pSPA

Table 5. Designated sites near to Scapa Flow test site

Site name	Protection status	Reason for protection
Loch of Stenness	Special Area of Conservation	Coastal lagoons.
Lochs of Harray and Stenness	Site of Special Scientific Interest	Aggregations of non-breeding birds: goldeneye, pochard, tufted duck, scaup. Saline lagoon. Eutrophic loch. Freshwater nerite snail and caddis fly.
Orkney Mainland Moors	Special Protection Area	Presence of breeding hen harrier red-throated diver and short-eared owl.
Hoy	Special Protection Area	Aggregations of breeding birds: Arctic skua, great black-backed gull, guillemot, kittiwake, red-throated diver, fulmar, puffin, great skua, peregrine and seabird assemblage.

Hoy	Special Area of Conservation	Base-rich fens, alpine and subalpine heaths, blanket bog, plants in crevices on base-rich rocks, dry heaths, acid peat-stained lakes and ponds, wet heathland with cross-leaved heath, hard-water springs depositing lime, vegetated sea cliffs.
Hoy	Site of Special Scientific Interest	Geological notified features include: coastal geomorphology of Scotland, Old Red Sandstone Igneous, Quaternary period of Scotland and non-marine Devonian. Notified biological features in terms of habitats include blanket bog, dystrophic loch, upland assemblage and upland oak woodland. In terms of notified bird features, there is a breeding bird assemblage present and a breeding seabird colony. Other notified bird species include: Arctic skua, fulmar, great black-backed gull, great skua, guillemot, peregrine and red-throated diver.
Hoy and West Mainland	National Scenic Area	A palimpsest of geology, topography, archaeology and land use. An archaeological landscape of World Heritage Status. Spectacular coastal scenery. Sandstone and flagstone as an essence of Orkney. Long-settled and productive land and sea. The contrast between the fertile farmland and the unimproved moorland. A landscape of contrasting curves and lines. Land and water in constantly changing combinations under the open sky. The high hills of Hoy. The townscape of Stromness, its setting and its link with the sea. The traditional buildings and crofting patterns of Rackwick.
Scapa Flow	Proposed Special Protection Area	Breeding birds: red-throated diver. Non-breeding birds: black-throated diver; common eider; European shag; great northern diver; long-tailed duck; red-breasted merganser; Velvet scoter and Slavonian grebe.

3.7 Cultural heritage

Scapa Flow was the base for the Royal Navy Home Fleet in both the first (WWI) and second (WWII) World Wars and, as such, several both WWI and WWII military remains can be found at points around the coast. As the German High Seas Fleet was scuttled in Scapa Flow at the end of WWI, the remains of relatively intact wrecks are in the south and west of the Flow, much to the south of Scapa Flow. Of more site-specific interest relative to Scapa Flow, the remains of HMS Royal Oak are located approximately 4 km to the north.

There is the potential for the presence of submerged landscapes preserved by the accumulation of sediment. However, interrogation of the RCAHMS, Historic Scotland and Local Authority Sites and Monuments Records database shows that, whilst there are sites of archaeological interest along the nearby coast, there are no known archaeological sensitivities in the Scapa Flow test site area.

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, there are not expected to be any additional environmental impacts associated with the works pertaining to this application.

4.1 Environmental monitoring

During maintenance activities and the TSB 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 5 provides the location of the designated haul out sites referred to in the proposed measures.

Table 6. 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 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.

Measure summary	Description
	<p>Sudden changes in speed, duration and engine noise will be avoided to reduce any disturbance to marine mammals in the vicinity.</p> <p>Rafts of birds will not be intentionally flushed.</p> <p>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.</p>

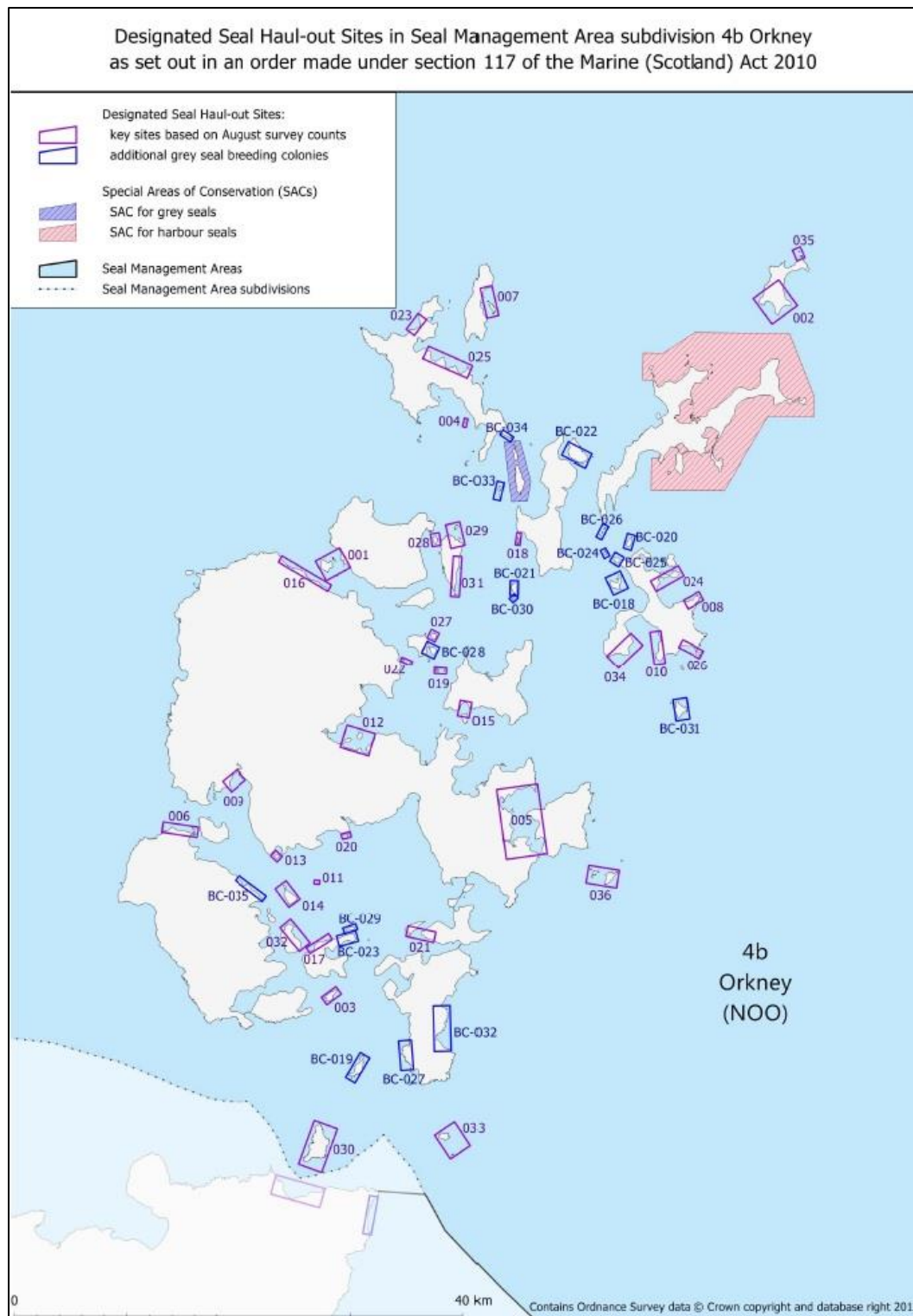


Figure 7. Designated seal haul-out sites in Seal Management Area subdivision 4b Orkney as set out in an order made under section 117 of the Marine (Scotland) Act 2010

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 Scapa Flow test site was conducted. This assessment has been submitted as supporting documentation to this application, see Scapa Flow Scale Wave 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

As the test site lies within Scapa Flow, the types of vessels identified as using the area are typically: ferries plying to and from the southern isles of the Orkney Islands, namely Hoy and Flotta, operated by Orkney Ferries and private charter; fishing vessels accessing fishing grounds off the west coast of Orkney Mainland; dive boats on passage to the many dive sites around Scapa Flow; and yachts visiting the ports located around Orkney. It should also be noted that the RNLI has lifeboat stations at Stromness and Kirkwall (Scapa) so the lifeboat may pass the site when engaged in activities.

There is very little commercial shipping activity through or near to the Scapa Flow test site, with the largest vessels excluded through the IMO adopted ATBA. There is no ferry traffic. However, very significant vessels anchor at nominated anchorage locations to the west of the site and may be engaged in STS hydrocarbon transfer operations. These activities are well regulated by the Statutory Harbour Authority.

Between April and September, a significant number of cruise ships visit Orkney. The main destination port for these large vessels is traditionally Hatston Pier (Kirkwall) on the eastern side of Orkney Mainland; however, more recently, cruise ships have begun to utilise the port of Stromness. There is little chance that cruise ships will come in close proximity to the test site.

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 7. 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.
EMEC Procedures	EMEC has a number of SOPs and standards in place to reduce navigation risks, such as: <ul style="list-style-type: none"> • Task risk assessment; • Control of work <ul style="list-style-type: none"> ○ 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.

Additional mitigation measures can be applied to the deployment of the TSB and these are listed below in Table 8.

Table 8. Possible additional mitigation measure associated with TSB deployment

Possible measure	mitigation	Description
Heightened monitoring in adverse met-ocean conditions		During gale force winds, periodic monitoring of the TSB is recommended to ensure excessive forces are not acting on the moorings which might cause a breakout.
Inspection and maintenance programme		Regular maintenance regime undertaken by EMEC to check the TSB, its fittings and any signs of wear and tear. This should identify any failings which might result in a mooring failure and breakout.
GPS alert system for turbine moving		Remote monitoring of TSB to detect any major movements that might indicate a breakout for immediate response. Implement GPS excursion monitoring.
Marking and Lighting		TSB to be lit to the requirements of NLB and marked in line with IALA guidance. Appropriate statutory sanctions must be in place

Possible measure	mitigation	Description
		to exhibit, alter or discontinue lighting. Light pattern is a standard 5 yellow flashes for a Special Mark.
Liaison with local stakeholders		Orkney Islands Council Marine Services, the MCA and NLB will be notified prior to installation of the TSB to confirm that adequate risk controls are in place. EMEC also conducts regular stakeholder consultation events to ensure that local marine users are aware of the pipeline of activity.
Installation, maintenance and removal		All vessels undertaking activities on site should comply with EMEC standard operating procedures. Vessels should be mindful of other navigating vessels and avoid disrupting the activities of others.

5.3 Hazard identification and risk assessment

A Hazard Identification and Risk Assessment (HIRA) was conducted as part of the Scapa Flow Scale Wave 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 regular deployment of the TSB, it is not expected that an HIRA will be required in connection with any of the work relating to this application. However, EMEC will apply its judgement and expertise in deciding if an HIRA will be needed for any maintenance procedures undertaken.

A HIRA would be expected to be undertaken in collaboration with the developer if the TSB was being deployed onsite in the same operation or through simultaneous operations with a test device onsite.

6 References

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Annex A: Drawing of infrastructure

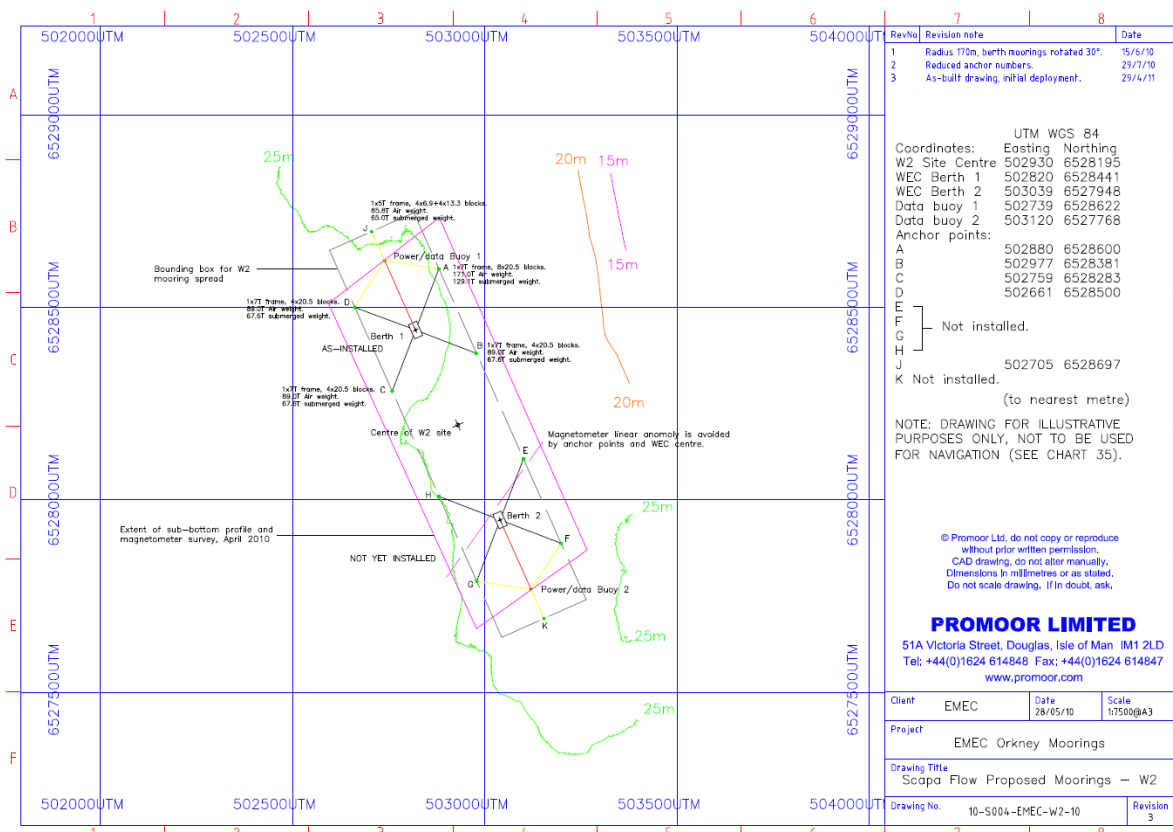


Figure 8. As built layout of the Scapa Flow scale wave test site

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