

## ENVIRONMENTAL EFFECTS METADATA SURVEY FORM

Name

Tom Clements

Date submitted

November 27, 2014

Project name: Wave Hub Marine Energy Test Centre, Cornwall

Planned

In Operation

Completed

Project description:

*Project Developer:* South West of England Regional Development Agency

*Technology Developer:* Wave Hub Ltd

*Technology type:* Various

*Resource (wave, tidal):* Wave and wind

*Project scale (test site, prototype, array, commercial):* Test site

*Installed capacity (MW):* 20MW

*Project Website:* <http://www.wavehub.co.uk/>

*Launch Date:* November 2010

*Additional Description:* Wave Hub is a grid connected test site. It aims to facilitate WEC development through final demonstration and pre-commercialisation development stages by allowing developers to install, operate, and monitor commercial-scale Wave Energy Converters (WECs) in realistic offshore marine conditions over a number of years. By doing so, Wave Hub aims to address the support gap between initial devices, typically less than 2MW, and the arrays of several devices that will be required for commercial viability. It is anticipated that the Wave Hub project will bring a variety of direct and indirect benefits to the south west region, such as:

- Production of a significant amount of clean, renewable energy in the south west region;
- Promotion of the south west region as a leader in the field of wave power electricity generation;
- Potential creation of a number of new jobs; and
- Creation of new industry and expansion of existing industry capable of manufacturing, deploying, maintaining, inspecting, repairing and decommissioning the potentially wide range of devices likely to be deployed.

The deployment area is located 16km off the north coast of Cornwall (north east of Saint Ives) and covers an area of 8km<sup>2</sup>. Within this area there are four berths for WECs and their mooring spreads. Water depths at the site range from 48 to 58m.

Each berth has its own Underwater Power Converter Unit (PCU); i.e. transformers and circuit breakers that receive power generated by the WECs via semi flexible cables. Each PCU is connected to a single Termination and Distribution Unit (TDU) which in turn connects to the onshore infrastructure via a subsea export cable.

The infrastructure present at the site allows for an export capacity of 30MW, this is upgradable to 48MW. However, the consent granted in 2007 under Section 36 of the Electricity Act 1989 allows different wave energy generation technologies to be deployed at the site with a combined capacity up to 20MW.

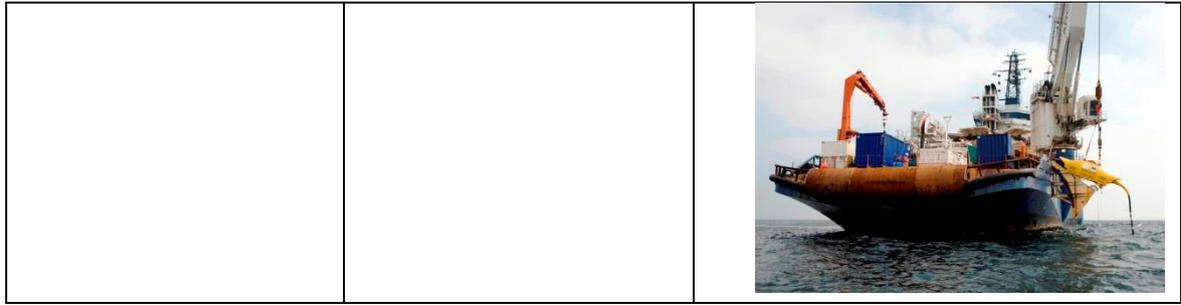
Export cables: The 12-tonne TDU is linked to the UK’s grid network via a 25km, 1300 tonne subsea cable capable of operating at 11kV and 33kV. The cable was manufactured by JDR Cable Systems in one continuous length. It is made up of six copper cores, 48 fibre optic cores, two layers of steel wire armouring and an outer polymer sheath giving it a total diameter of 16 centimetres. As a cable protection measure, 80,000 tonnes of rock was placed over the cable along its length until 5km from the coast. This resulted in the cable being buried under approximately 0.5m of rock for most of its length. Using directional drilling the cable was buried 1-3m below the sediment surface from approximately 5km offshore.

Onshore infrastructure: Wave Hub’s onshore substation provides an intermediary connection point for the cable to the 33kV bulk electricity system operated by Western Power Distribution (WPD) at the existing Hayle substation complex. Electricity generated at the Wave Hub will be passed into the regional and national electricity supply networks (e.g. the National Grid). The substation facilities include:

- Power quality room;
- Circuit breaker room;
- Metering room;
- Control room with space for WECdevelopers’ transmission equipment;
- Mess room with associated facilities for the various operators who will be monitoring; equipment or providing maintenance on an occasional basis; and
- Remotely operated vehicle (ROV) workshop and garage.

Vessel Spread: The following vessels will be required during construction and operation:

Vessel type	Activity	Comment
Cable lay vessel	Installation of the subsea infrastructure.	PDU being deployed from the vessel Nordica. Other vessels may also have been used.



Location: A wave energy demonstration and proving site located at 50 m water depth 16 kilometers off the north coast of Cornwall in South West England.

Coordinates: The area of consent is located between the following four points:

- 313 555.80E 5580 274.15N
- 313 066.98E 5584 242.86N
- 315 043.42E 5584 451.58N
- 315 546.18E 5580 501.20N

Process Status: An EIA was completed following a preliminary scoping study and the related Environmental Statement was submitted with all the applications. Following application an extensive period of public consultation was then undertaken which was completed in March 2007. Consents were then granted in September 2007 and the FEPA license was granted in December 2007. An additional FEPA license for cable stabilization operations was granted in August 2010. The cable and the Wave Hub were completely installed and connected to the grid in November 2010.

There are no devices currently deployed at the site, however Carnegie Wave Energy, Seatricity and Fortum have reserved berths at the site. The fourth berth is reserved for floating wind devices.

Licensing information: Wave Hub was granted consent in 2007 under Section 36 of the Electricity Act 1989. This allows different wave energy generation technologies to be deployed at the site with a combined capacity up to 20MW.

Wave Hub also has a licence under Section 34 of the Coastal Protection Act 1949 (CPA) and licences under Part II of the Food and Environmental Protection Act (FEPA) 1985 for the installation of Wave Hub, its subsea cable and the stabilisation and protection of the cable by rock armouring. Developers coming to Wave Hub need to apply for their own FEPA licences. The Wave Hub Team will advise and support these applications which will be able to draw on the existing environmental and other baseline data.

- The Licence Holder must submit and agree a detailed schedule of planned construction and monitoring with the Licensing Authority at least four months prior to the commencement of any construction works. This schedule should contain timings for mobilisation of plant, delivery of materials and all installation works and timings for preparing and submitting survey specifications, data collection, analysis, report writing and dates that monitoring reports will be submitted to the Licensing Authority.

Variations of the timetable and schedule must be confirmed immediately, in writing, with the Licensing Authority and include an assessment of the potential impact on the monitoring programme detailed in this licence.

- The Licence Holder must submit a Method Statement to the Licensing Authority at least four months prior to the commencement of any construction works. This Method Statement must describe the construction works in detail confirming the final choice of installation techniques, cable type and specification (including any additional shielding to mitigate potential impacts of EMF), cable burial depths, cable laying technique, contractors and vessels. Construction cannot commence until the Licensing Authority has given its written acceptance of the method statement. If the methods described differ significantly from those discussed in the Environmental Statement the Licensing Authority reserves the right to vary Licence 33383/07/0 to ensure that appropriate conditions are in place<sup>1</sup>.

To ensure the integrity of the Wave Hub infrastructure and to minimise hazards to mariners the cable route should be monitored to ensure that the cable remains buried. Should the cable become exposed a separate Food and Environment Protection Act/Coast Protection Act application must be submitted to the Licensing Authority for any cable protection operation that may be needed (rock armour). In addition standard conditions of consent for miscellaneous works (permanent) apply.

#### Key Environmental issues:

- Direct noise and visual disturbance to birds during cable laying/removal operations, caused by the presence of machinery and increased human activity;
- Physical loss of roosting and foraging habitat along the cable trench during construction;
- Disturbance primarily through increased shipping activity;
- Loss of feeding area due to the presence of WECs;
- Impacts of accidental pollution;
- Loss or degradation of roosting and foraging habitat due to accidental pollution during construction activities.
- Increased food availability as a result of the 'sanctuary' created by the ATBA;
- Risk of collision / entanglement with WECs, cabling and anchoring;
- Disturbance / disorientation of birds due to lighting at night.
- Potential for an effect on marine ecology as a consequence of changes to water quality during the construction phase;
- Potential disturbance to marine communities in St Ives Bay due to the burial of the cable under the seabed;
- Potential for effect on marine habitats and species as a consequence of effects of the hydraulic and sedimentary regime of St Ives Bay;

---

<sup>1</sup> Food and Environment Protection Act 1985 : part ii (as amended) - deposits in the sea in connection with marine construction works, Licence 33383/07/0,2007

- Potential impact on benthic communities as a result of habitat loss and disturbance due to the laying of the cable on the seabed and construction of the Wave Hub;
- Potential for habitat creation;
- Potential impact on cetaceans, elasmobranchs (sharks and rays) and other marine species during the construction phase (e.g. due to water quality effects and noise) and during the operational phase due to noise generation;
- Electromagnetic field disturbance potentially affecting elasmobranchs in particular, and possibly to other marine species.

Environmental webpage: N/A

Mitigation measures:

- All construction, maintenance and decommissioning works in the intertidal zone should be undertaken outside of the winter period (October to March);
- Where works during the winter cannot be avoided (for example for essential maintenance), these should not be undertaken for at least two hours after high tide where high tide Wave Hub occurs early in the morning (i.e. within two hours of sunrise);
- The duration of work and extent of work area should be kept to a minimum;
- Best working practices and adherence to the relevant Environment Agency Pollution Prevention Guidelines (PPGs) should be employed to minimise pollution risk;
- Lighting at night time should only be permitted where required for safety and navigational purposes.
- The correct specification of piles and pile driver will be used for the works, avoiding the use of excessive energy (and noise generation).
- Piling activities will use a soft start procedure.
- It is proposed that the site to shore cable will be buried in the sediment by up to 3m in the near-shore waters of St Ives Bay reducing the intensity of the induced electrical field.

Baseline studies and project effects studies: Wavehub Cornwall				
General description	The following field surveys were undertaken (or commissioned by) WaveHub to inform baseline characterisation. For more detailed results see the Environmental Statement <sup>2</sup> .			
Receptor	Study description	Design and methods (brief description)	Results (brief description)	Status (planned, underway, completed, with dates)
Offshore birds	Monthly offshore bird counts over 1 year	The survey provided a high level overview of offshore birds in the wider study area rather than a site specific assessment of the deployment area, and the eastern survey transects cover the	A total of 13 seabird species were recorded during the survey. These were fulmar, gannet, great black-backed gull,	Completed (2006)

<sup>2</sup> Available [Online]. <http://www.wavehub.co.uk/wp-content/uploads/2011/06/Environmental-Statement-June-2006.pdf>. Accessed 25/11/2014.

		position of new deployment area. Sightings of basking shark were also noted in this survey.	guillemot, herring gull, kittiwake, lesser black-backed gull, Manx shearwater, puffin, razorbill, shag and storm petrel.	
Intertidal birds	Monthly intertidal bird counts over 1 year	Ten surveys were undertaken between February 2005 and January 2006. Monthly surveys were undertaken during the winter months and bi-monthly surveys during the summer (February-May, July, and September-January). Each survey comprised hourly instantaneous counts of birds through a half-tide cycle, from high tide to low tide. The survey area was divided into three sections. The species and number of birds using each of the three areas was recorded. Observations were made from the cliff and dune tops using 8x magnification binoculars and a 27x magnification telescope.	The intertidal area at Towan's Beach, Hayle, is used by a limited number of gulls and wading birds throughout the year. A total of 18 species (excluding carrion crow and pied wagtail) were recorded using the intertidal zone and beach above the high tide line.	Completed (2006)
Intertidal ecology	Benthic ecology survey with biotope mapping	The survey was conducted at Hayle beach and comprised taking core samples along three transects that were established perpendicular to the shoreline and within the proposed area of the cable.	The biotopes identified can be divided into littoral sediment biotopes and littoral rock biotopes. No obvious infauna were recorded during the biotope survey.	Completed (2006)
Sub-tidal ecology	Sample collection and laboratory analysis and camera work for benthic ecology survey with biotope mapping	Seabed samples using a 0.1m <sup>2</sup> Hamon grab were taken from 30 sampling stations. Samples were processed through a 1mm mesh and all specimens were identified to the lowest taxonomic level possible. Epibenthic samples were collected using a 2m beam trawl with a 20mm mesh net and 4mm mesh codend liner. The majority of the catch was identified in the field.	A total of 276 infaunal species were recorded. Of these species, approximately 44% are Annelida, 25% Crustacea, 21% Mollusca, 4.3% Echinodermata and 6% from other phyla. The habitat present changed from predominantly sand in the nearshore cable corridor to	Completed (2006)

			pebble and rock further offshore. Rock was dominant in the southern section of the deployment area, whereas sand dominated the north.	
Marine mammals	TPOD device monitoring cetaceans	The survey provides a high level overview of cetacean behaviour rather than a site specific assessment of the deployment area. The TPOD data is considered to be representative given that cetaceans are constantly on the move so that their distribution does not generally show sharp local variations. For example, monitoring at Danish offshore windfarms shows similar trends and levels of cetacean activity at control sites up to 10km away.	TPOD data indicate that the area is used regularly at low intensity by harbour porpoises and dolphins; it should be noted that it is not possible to distinguish the species present from the data. However, the two most commonly reported dolphins in the area are the bottlenose and common dolphin.	Completed (2006)
<b>Reports and papers</b>	<ul style="list-style-type: none"> <li>Wave Hub Environmental Statement. 2006. Available [Online] <a href="http://www.wavehub.co.uk/wp-content/uploads/2011/06/Environmental-Statement-June-2006.pdf">http://www.wavehub.co.uk/wp-content/uploads/2011/06/Environmental-Statement-June-2006.pdf</a>. Accessed 27/11/2014</li> <li>Wave Hub Development and Design Phase Final design report. 2006. Available [Online] <a href="http://www.wavehub.co.uk/wp-content/uploads/2011/06/Wave-Hub-Final-Design-Report.pdf">http://www.wavehub.co.uk/wp-content/uploads/2011/06/Wave-Hub-Final-Design-Report.pdf</a>. Accessed 27/11/2014</li> </ul>			

<b>Monitoring and adaptive management: Wavehub Cornwall</b>				
<b>General description</b>	The following mitigation and monitoring measures are proposed within the project Environmental Statement. <sup>3</sup>			
<b>Receptor</b>	<b>Monitoring program description</b>	<b>Design and methods</b> (brief description)	<b>Results</b> (brief description)	<b>Status</b> (planned, underway, completed,

<sup>3</sup> Available [Online]. <http://www.wavehub.co.uk/wp-content/uploads/2011/06/Environmental-Statement-June-2006.pdf>. Accessed 25/11/2014.

				with dates)
Offshore birds	Post-construction monitoring	To be confirmed	N/A	Planned
Marine mammals	To verify the findings and predictions of the Environmental Statement; and define the level of noise generated by WECs during the operational phase.	Monitoring could be undertaken following the same approach to the survey work that was undertaken to inform the baseline conditions for the EIA process (i.e. the use of a T-POD deployed on a wave rider buoy) and analysis of the data.	N/A	Planned
<b>Reports and papers</b>	<ul style="list-style-type: none"> <li>Wave Hub Wave Monitoring Project, Interim Report Number 3. 2010. Available [Online] <a href="http://www.wavehub.co.uk/wp-content/uploads/2011/06/Wave-Hub-Wave-Monitoring-Report-3-February-2010.pdf">http://www.wavehub.co.uk/wp-content/uploads/2011/06/Wave-Hub-Wave-Monitoring-Report-3-February-2010.pdf</a>. Accessed 27/11/2014</li> </ul>			