

WATER AND MARINE ADVISORY UNIT REPORT ON RENEWABLE ENERGY TEST DEVICE SITE AT SPIDDAL IN GALWAY BAY (FS006566)

An application has been received from Marine Institute to develop an offshore Renewable Energy Test site in an area of 37.52 Ha in the north of Galway Bay close to Spiddal.

BACKGROUND

The Sustainable Energy Association of Ireland (SEAI) in association with the Marine Institute established a ¼ scale wave energy test site for prototype wave energy converters (WEC's) in Galway Bay in 2006 for which a Foreshore Lease was granted by the then DCMNR in 2006 for an area of foreshore off the Spiddal coast.

In April 2015 a 4km fibre optic telecommunications cable, containing 12 fibres was installed between the test site and a shore station via Spiddal Pier under Foreshore Licence MS 51/12/622(FS005751) This cable will supply power to the test site and allow unlimited data transfer from the site for researchers testing innovative marine technology including renewable ocean energy devices. A subsea observatory was deployed in the test site in July 2015. The fibre optic cable connects to the subsea observatory via Cable End Equipment (CEE). The CEE will provide 400V DC 3.5Kw and 1Gb/s Ethernet, upgradable to 10Gb/s in future expansions.

Apart from the existing wave energy test site which requires upgrading there are no other similar operations or activities planned for or currently in the locality.

EXISTING DEVELOPMENT

The current test site infrastructure consists of the following:

Under Foreshore Lease FS004904

- Navigational Markers at the four corners of the existing site
- A Wave rider buoy
- An acoustic monitoring buoy
- SmartBay data buoy

Under Foreshore Licence FS005751

- A cable to shore (Installed in 2015 to improve environmental monitoring in the area)

CURRENT FORESHORE LEASE APPLICATION

The Marine Institute applied for a new Foreshore Lease to DHPCLG for a period of 35 years for the same area of foreshore. The purpose of this lease application is to allow for the upgrade of the current site infrastructure and the deployment of a wider range of renewable energy devices and novel marine sensors and technologies. The location of the test site is shown on Drawing No 01.

Proving Ocean energy converter technology in a benign environment like Galway Bay is critical to the future development of the industry as a whole. It will give confidence to investors to proceed to full scale pre-commercial development, in support activities at the full scale Atlantic Marine Energy Test Site (AMETS) in Belmullet, Co Mayo

This application is assessed in the context of the following submitted documentation:

- *Completed Foreshore Lease Application form dated 6/4/2016(updated from an earlier completed Application Form dated 11/2/2016)*
- *Environmental Report (prepared by Marine Institute, SEAI and SmartBay and dated February 2016)*
- *Environmental Impact and Mitigation Desk Study for the Galway Bay Marine and Renewable Energy Test Site (prepared by Aquafact International Services Ltd and dated October 2015)*
- *“Cetacean presence at the Ocean Energy Test Site Spiddal: As determined through Land Based visual monitoring and static acoustic monitoring using POD’s” (prepared by Dr Joanne O’Brien Galway –Mayo Institute of Technology and dated March 2013)*
- *“Seascape and Visual Impact Assessment Proposed Galway Bay Marine Energy Test Site”(prepared by MACROWORKS and dated January 2016)*
- *Visual Impact Photomontages –(5 Number included)-*
- *Galway Bay Test and Demonstration Site Procedure Manual Version 3 (Prepared by SMARTBAY and dated 27/11/2014)*
- *Marine Environmental Appraisal of an Ocean Energy Test Site in Inner Galway Bay (a Benthic Appraisal of Test Site) (Prepared by Aquafact International Services Ltd and dated April 2010)*
- *An aerial survey of harbour seals in Ireland. Part 2 Galway Bay to Carlingford Lough August-September 2012 (a report for NPWS of DAHG) (prepared by Callan Duck and Chris Morris of NERC Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, East Sands, Scotland and dated December 2012)*
- *Marine Safety Statement (prepared by Marine Institute ,SEAI, SMARTBAY and dated February 2016)*
- *Marine Archaeology Impact Assessment for the Marine Institute (prepared by Finn Delaney of Geomara Ltd and dated September 2015)*
- *Appropriate Assessment Stage 1 Screening Report (prepared by Aquafact International Services Ltd and dated November 2015)*
- *HSEQ Certification*

- *Drawing No 01 Site Location Map Rev 01 ,1:20000 on A3 (shows Site Location Distances)*
- *Drawing No 02 Site Location Lat/Long Rev 01 ,1:20000 on A3*
- *Drawing No 03 Site Location ITM Rev 01 1:20000 on A3*
- *Environmental Screening Report* Dated August 2015 prepared by Marine Institute*
- *Environmental Screening Report Addendum 1* dated November 2015 prepared by Marine Institute*

*These reports were submitted earlier in relation to the EIS Screening Element of the process and are still relevant to this application.

PROPOSED DEVELOPMENT

This investigation/development stage will consist of a number of activities which will be required to upgrade the current test site infrastructure to facilitate the connection and testing of scaled devices and novel instruments in a powered test site.

The proposed development on site can be separated into three categories as follows:

- 1 LONG TERM INFRASTRUCTURE ON SITE
- 2 RECURRING SHORT TERM INFRASTRUCTURE
- 3 TEST AND DEMONSTRATION DEVICES

There will also be a requirement as appropriate for cables and cabling associated with the inter connection between 1, 2 and 3 above (see ‘Cables and Cabling’ below).

Full details for all proposed test site infrastructure and device dimensions is provided with reference to Section 4.3 of the accompanying Environmental Report, and also with reference to Sections 2.1, 2.2 and 2.3 of the ‘‘Environmental Impact and Mitigation Desk Study’ report.

LONG TERM INFRASTRUCTURE ON SITE

Navigational Markers (Cardinal Marks)

Cable End Equipment (CEE) - and Frame

WaveRIDER Data buoy

SeaStation Platform (to provide power to and dissipate power from ocean energy devices as well as providing data communications to shore)

Gravity Base (for deployed WEC’s)

RECURRING SHORT TERM INFRASTRUCTURE

Smart Bay data buoy

Acoustic Array (for monitoring underwater sound)

Trawl resistant Acoustic Doppler Current Profiler (ADCP) (to measure water current speeds)

TEST AND DEMONSTRATION DEVICES

The operational phase will consist of the deployment of scaled test devices. A wide variety of wave, tidal and floating wind devices have the potential to be deployed at the site and they may be either floating or mounted on the seabed. The duration of deployment will be project specific but could range from weeks up to a maximum of 18 months (ref Environmental Report S 4.5.4 ‘Duration and Phasing’ Pg.76

The maximum number of scaled test devices deployed in the test site at any one time will be 3, with the likely scenario being that 1 will be deployed at a time

An indicative list of potential devices with a limited time period for their deployment and testing is also illustrated in the Environmental Report (ref Section 4.3.4) and also with reference to Sections 2.1, 2.2 and 2.3 of the ‘Environmental Impact and Mitigation Desk Study’ report. The types of devices that could be deployed include ocean energy converters and components, marine technology test and demonstration experiments, scientific instrumentation and sensors-.

Cables and Cabling

The interconnecting cables will be designed for this specific application with embedded strength members and a protective jacket commensurate with its intended use and performance.

The umbilical cables between the SeaStation and a WEC will be designed to float within the water column and not touch the seabed to avoid any interference with the seabed and to reduce wear and tear on the cable. All cables will be designed with EMF shielding. Cables will inter connect between devices, SeaStation and CEE and will float in the mid water column with some cabling resting on the seafloor.

VESSEL MOVEMENT ACTIVITIES/DECOMMISSIONING

The vessel route (for installation/operational and decommissioning phases) will be from Galway docks to Spiddal and return. Rossaveel may also be used .Larger vessels may arrive or depart from/to their previous/next port without going to Galway Port. There will be no especial intensification of vessel activity as operations can be scheduled to reduce excessive vessel presence on site through any given period

Decommissioning will involve the removal of devices, equipment, sensors, moorings, gravity bases and cardinal marks.

The test site is an integrated component of Ireland’s Ocean Energy Strategy and will facilitate testing and validation of various wave energy converters in an open ocean environment.

FORESHORE ISSUES – (Technical elements)

Engineers comments relate specifically to the Technical aspects of this application which are addressed in the “Environmental Report”, , “Galway Bay Test and Demonstration Site Procedure Manual Version 3” and also with reference to the “Environmental Impact and Mitigation Desk Study” report. A brief resume of the findings of the Seascape and Visual

Impact Assessment, as presented in Section 11 of the Environmental Report and also with reference to the and the MACROWORKS “Seascape and Visual Impact Assessment” report, is also provided .

Coastal Processes (ref Section 14 of the Environmental Report)

The impacts of the operational phase of the test site are confined to the physical presence of the devices ,equipment, infrastructure and cables within the site either on the seabed, in the water column, or at the surface .The operation of the devices may impact on hydrodynamics and sediment processes.

The chief findings as presented in the Environmental Report can be summarised as follows:

- The placement of any infrastructure on the seabed will disturb and remobilise sediments in the immediate footprint of the object. This will result in a short term (minutes) localised increase in suspended sediment levels and turbidity therefore they will be so low as to have no effect on water quality habitats or species (naturally high background levels of 65000 mg/l have been recorded in Galway Bay during storm conditions which are orders of magnitude greater than what would be generated by the proposed activities).
- Sediment disturbance during operational phase include for scour around gravity bases however given the relatively low velocities in the area any impact from this is likely to be minimal. The movement of moorings, cables and devices on and off the seabed has the potential to disturb and remobilise sediments .It is estimated that up to 5m either side of the lines/cables could be affected however the sediments disturbed by this activity will be orders of magnitude lower than that generated during storm events and any short term temporary impacts from this will have a negligible impact on the environment.
- The maximum footprint on seabed of the combination of worst case scenario infrastructure and devices is 337m² which is less than 1% of the total area of seabed within test site.
- Disturbance to sediments and the resultant increases in suspended sediments and turbidity and subsequent deposition of sediments will be of such a scale that impacts will be negligible.
- Sediment transport pathways and coastal processes could be impacted by localised hydrodynamic changes associated with wave or tidal energy removal by the operating device. The maximum footprint on the water surface of the combinations of worst case scenario infrastructure and devices is 1436m² which is less than 1% of the total water surface within the test site.

Studies carried out to date on single devices or very small arrays” have shown that due to the small footprint of these devices, entering into large bodies of swiftly moving water, there is little possibility of measurable changes to the physical environment (Ref Section 14.3.3).Wave energy extraction will be low and somewhat recoverable as there is a large area of fetch after any device before it comes to the

shore. As a result, given the scale of the proposed test site, and the fact that the devices are scaled and not full size, the likelihood of any impact occurring is remote and there would be no change to the physical environment

- It is therefore concluded that “the test site will only have a low impact, of negligible consequence, on coastal processes in Galway Bay”.

Based on the findings as presented in the Environmental Report, Engineering is satisfied that the proposed project will have minimal impacts on coastal processes.

Visual Impact Assessment (ref Section 11 of Environmental Report)

Visual Impact Assessment (VIA) is addressed in Section 11 of the Environmental Report and the VIA was carried out by Macroworks Ltd and their associated report is included in the submitted documentation accompanying this foreshore licence application (ref “Seascape and Visual Impact Assessment Proposed Galway Bay Marine Energy Test Site” (prepared by MACROWORKS and dated January 2016) along with the 5 Number photomontages which formed part of the VIA. The main findings of the VIA were as follows:

- The proposed test site is 1.3km offshore and most of the components will not be more than a few metres above the waterline. While some of the components may be discernible from distances of up to 10km in optimal viewing conditions, they are likely to be barely discernible and thus unlikely to give rise to any significant visual impact at such distances.
- The degree of visual impact is only likely to occur at viewing distances of less than 2km and only for the brief worst case scenario period when all structures are in place at once. Beyond 2km impact levels fall away quickly to slight to imperceptible. The three structures that will tend to stand out the most are the floating turbine, due to its height and movement, the SeaStation platform, due to its bulk, and the twin-float wave machine due to its length.
- The proposed site is currently identified by 4 No buoys at each corner which are discernible in clear viewing conditions but are unlikely to draw the attention of casual observers. This marine energy test site has been in operation for nearly 10 years and the occasional placement of wave energy devices will not be an unfamiliar occurrence for the local population.
- Given that the proposed Renewable Energy Test Site does not represent significant bulk, visual impacts will almost entirely be from “visual intrusion” rather than “visual obstruction”.
- The proposed structures may contribute a minor degree of visual clutter to the seaward view. However this is a living and working section of the coastline that hosts an array of structures and land uses and it is not considered that the Test Site conflicts with the character and values associated with the coastal vistas in this area.
- Important ameliorating factors are the temporary nature of the installations for the devices, and the fact that it will be uncommon for all of the structures to be in place at any one time.

- There will be no residual seascape or visual impacts once the various structures are eventually removed from the site.
- Overall it is not considered that the proposed Test Site will give rise to any significant impacts in VIA terms.

STRUCTURAL INTEGRITY OF PROPOSED STRUCTURES

The proposed development will involve the deploying of Long Term Infrastructure (Navigational Markings, CEE, Waverider buoy, SeaStation Platform, Gravity Bases), ,Short Term Recurring Infrastructure(SmartBay data buoy, Acoustic Array ,ADCP) and Test and Demonstration Devices(a wide range of potential devices as listed earlier including WEC's , Rotating Tidal Turbines and Tetra float etc.) All these Structures and devices will have mooring and anchoring arrangements as set out in the application. - including some structures which will be anchored by their own independent weight-.

A key component in relation to the structural integrity of the proposed structures is the proposed anchoring/mooring arrangements which must be robust enough to maintain all structures in place in the exposed sea conditions and to resist all wave/tidal forces in this regard. From the submitted drawings only a typical set of details in this regard have been submitted with final design dependent on the type of Structure being deployed.

MANAGEMENT PROCEDURES FOR THE FORESHORE LICENCE/LEASE

The procedures and protocols under which the Marine Institute intend to manage the Foreshore Licence/ Lease(if/when granted by DHPCLG) in terms of the individual test site operators are outlined with reference to the SEAI Document entitled “Galway Bay Test and Demonstration Site Procedure Manual” Version 3 dated 27/11/14 which was included in the application documents.

Summary

- The foreshore lease for the test site is held by Marine Institute and funding for activities, operation and on-going maintenance of the site is available through SEAI. SmartBay Ireland is contracted to oversee the day to day management and operation of the test site.
- The “Procedures Manual” outlines the procedures to be followed by any company (the “developer”) wishing to use the Galway Bay Test and Demonstration Site to test their ocean energy conversion prototype or devices .It also states the “Conditions for Use” of those facilities, as well as the services provided by SmartBay to assist the users of the test site. The Application Form for use of the Test Demonstration Site by any developer is provided in Appendix B.
- An outline is provided of the legal, marine safety, environmental and operating conditions the users must satisfy prior to the device being granted access to the Test Demonstration Site
- The complete chain of stepped procedures for deployment of devices at the Test Site is outlined in Figure 1 on Page 9 of the Procedures Manual.

- SmartBay technical and operational personnel will provide direction, support and advice to developers, throughout all stages of device validation trials. Support will be provided from initial concept evaluation, planning, funding, application submission, pre-deployment, vessel selection, mobilisation, operations and maintenance, decommissioning, and, in conjunction with the Hydraulics and Maritime Research Centre (HMRC) Cork, independent device validation.
- The application documents (ref Appendix B “Application Form for use of Test Site”) confirm that the design of proposed Mooring configuration(including schematics of mooring and device) ,is to be undertaken by a competent party and that certificates or other evidence of similar authority used in the application process will also have to be submitted in the application made to Marine Institute by the test site developers .*This is acceptable to Engineering (ref Condition 7c).*

This Foreshore Application applies to all of the prototype test devices as outlined within the submitted application documents and in this regard it is recommended that on an annual basis Marine Institute should submit an Annual Report outlining details of all test devices types which were used at the test site, locations where deployed, timelines for their operations, name of developer, and a brief outline and summary as to the outcome of the test device operation.

Any devices not covered in the current submitted Foreshore Application will require a separate Foreshore Licence in advance of their deployment within the Test Site .It will be the responsibility of Marine Institute as holders of the Foreshore Licence(when/if granted) for the Test Demonstration Site to make the application on behalf of the developer who intends to deploy these test devices within the test site area and submit any incumbent additional Environmental/Scientific reports/documents where considered necessary to back up the application

LEASE MAP

This Map needs to have its own unique reference (Drawing Number) and certified and dated to make it suitable for Lease Purposes. The Map should be at appropriate scale on A3

CONCLUSION and RECCOMENDATIONS

The upgrade of the test site is an integral component of Ireland’s OREDP and will facilitate testing and validation of various ocean energy converters and prototypes in conditions that represents ¼ scale of open Atlantic environment. With an exceptional marine resource Ireland is in a unique position to capitalise on its natural advantages in the area of marine renewable energy. The experience gained from the deployment at the test site will assist commercial scale wave energy production in the future at suitable locations around the Irish Coast.

In conclusion Engineering has no objections to the granting of a Foreshore Lease/License to the Marine Institute for the upgrading of the existing marine renewable energy test device site in Galway Bay for 1 Long term infrastructure on site, 2 Recurring Short Term Infrastructure, 3 Test and Demonstration Devices as outlined in the submitted application

documents, and associated cables and cabling in connection therewith, subject to the following condition:

- 1. The Lessee shall use that part of the foreshore ,the subject matter of this Lease for the purpose of testing wave energy devices as set out in the Application Documents and for no other purpose whatsoever. The Lessee may also use adjacent foreshore but only to the extent necessary for the purpose of assembling and maintaining the wave energy devices and shall restore the said foreshore to its proper condition immediately after such use.**
- 2. Marine Notices, lighting and markings shall be carried out in consultation with the Marine Safety Directorate, Department of Transport, Tourism and Sport ,Leeson Lane Dublin 2**
- 3. Marker buoys must comply with CIL standard navigation safety requirements with regard to lighting positioning and mooring. In particular the Lessee shall adhere to the CIL’s recommendations and shall apply to the CIL for sanction of new navigational aids/buoyage and/or alteration of existing navigational aids/buoyage**
- 4. All vessels/floating plant shall have appropriate certification from the Marine Survey Office.**
- 5. The Lessee shall ensure that floating plant or machinery used in connection with the installation or maintenance of each device is adequately lit if in place at night or during times of poor visibility and shall also ensure that all associated vessels comply fully with relevant certification**
- 6. The Lessee shall ensure that equipment associated with the devices, in particular parts that may cause a hazard to navigation if not removed, is recovered and accounted for on completion of each testing programme.**
- 7. The Lessee shall, prior to the authorising the placing of each individual device in the Lease area for testing:**
 - a. Ensure that each device is applied for and vetted in accordance with the “Galway Bay Test and Demonstration Site Procedure Manual” (Version 3 dated 27/11/2014)**
 - b. Provide the Minister with details of each device**
 - c. Ensure that the anchor/moorings required for each separate testing device are certified by a chartered Engineer or other competent authority as fit for the purpose intended in terms of device to be used, structural integrity and site conditions.**
- 8. On an annual basis Marine Institute should submit an Annual Report outlining details of all test devices types which were used at the test site, locations where**

deployed, timelines for their operations, name of developer, and a brief outline and summary as to the outcome of the test device operation.

9. The Management and Operation of the Test Site shall be undertaken as set out in Section 17 ‘HSEQ Management System’ of the ‘Environmental Report’ dated February 2016 .In this regard any Method Statements developed/prepared in accordance with Section 17.7.5 (‘Method statement’) should be included in the Annual Report to be submitted to the Department as part of Condition 8 above. Details for the proposed removal of any redundant mooring/anchoring structures where and when no longer required should also be included.

10. The Lessee shall ensure that in the event of any spillage or accident occurring below or above HWM, which may impact on the foreshore during the carrying out of the works, the subject of this Lease or during operations following the completion of the works the Irish Coast Guard is notified immediately by telephone.

11. Decommissioning of the test site will be subject to consultation and agreement with DHPCLG and Galway County Council at the appropriate time and may involve removal of the WEC anchoring system, removal of the cardinal and other special marker buoys, removal of the interconnecting cables etc.



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