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1. Introduction

The Sustainable Energy Authority of Ireland (SEAI) in association with the Marine Institute (MI) established the ¼ scale wave energy test site for prototype wave energy converters (WECs) in Galway Bay in 2006.

The Marine Institute was granted a foreshore lease (SJM/10380/2005) by the then Department of Communications, Marine and Natural Resources in 2006 for an area of foreshore off the Spiddal coast in Galway Bay.

The Marine Institute now intend to apply for a new foreshore lease to the Department of Environment, Community and Local Government for a period of 35 years for the same area of foreshore.

The purpose of the lease application for the Galway Bay Marine and Renewable Energy Test Site 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 purpose of this screening report is to detail findings from a desktop analysis of the receiving environment that may be affected by the proposed development, and to document the procedures and outcome of the process undertaken as part of the screening.

This screening report establishes the likely effects of the proposed development on the environment and determines if an Environmental Impact Assessment (EIA) would be appropriate for the development.

In keeping with screening best practice, the developer is required to include:

- a plan sufficient to identify the area of interest (Figure 1);
- the characteristics of the proposed development (Section 4.1);
- the location of the proposed development (Section 4.2);
- a description of the development’s possible effects on the environment (Section 4.3);

These requirements are addressed in this report as indicated above. Sections 5 and 6 contain the findings from our analysis and our conclusions.
2. Legislative Requirement

EIA requirements derive from EU Directive 85/337/EEC (as amended) on the assessment of the effects of certain public and private projects on the environment. The primary objective of the EIA Directive is to ensure that projects which are likely to have significant effects on the environment are subject to an assessment of their likely impacts.

The approach adopted in the Directive is that EIA is mandatory for all Annex I projects on the basis that these project classes will always have significant environmental effects. In the case of Annex II projects, the Directive gives Member States considerable discretion in determining the need for EIA. The determination of the need for EIA can be made on a case-by-case basis or on the basis of thresholds or criteria set by the Member State. The EIA Directive does not refer specifically to ocean energy projects and no specific guidance has been formulated for developers or regulators.

The Irish EIA system implements the EIA Directive through the integration of its requirements into the land-use planning consent system (Planning and Development Regulations 2001, as amended), the foreshore consent system (Foreshore Act 1933, as amended) and several other development consent systems covering, for example, roads/motorway construction, light rail systems and the laying of gas pipelines.

Irish EIA legislation fully reflects the Annex I requirements of the European EIA Directive. In transposing the Annex II requirements of the Directive, Ireland chose to set mandatory thresholds for each of the project classes in Annex II.

In setting these thresholds, account was taken of the relevant circumstances in Ireland, including the general nature, size and location of projects and the condition of the receiving environment. The thresholds were then set at levels which distinguish between those projects which, by virtue of their nature, size or location, would be likely to have significant effects on the environment and those which would not.

The key issue for the Licensing Authority in the context of possible need for EIA of sub-threshold developments or of developments for which thresholds have not been set is whether or not such development is “likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location.”
3. Screening Assessment Methodology

The proposed development of the Galway Bay Marine and Renewable Energy Test Site is not of a Class specified in Part I or Part II of Article 24 of the European Communities (Environmental Impact Assessment) Regulations 1989 to 1999 for which the submission of an EIS is mandatory, and no specific thresholds have been set in respect of the development of a Marine Renewable Energy Test Site. The key issue in the context of the possible need for EIA of such a development is whether or not it is likely to have significant effects on the environment. The 1997 amending Directive (97/11/EC) introduced guidance for Member States in terms of deciding whether or not a development is likely to have a “significant effect on the environment”.

The guidance is provided by way of criteria set out in Annex III of the consolidated Directive. The criteria has been transposed in full into Irish legislation in the third schedule to the European Communities (Environmental Impact Assessment) (Amendment) Regulations 1999 (as amended), and in Schedule 7 to the Planning & Development Regulations 2001 (as amended).

The criteria are grouped under three headings and are used to help in the screening process to determine whether a development is likely to have a significant effect on the environment. The three headings are:

1. Characteristics of proposed development.

The characteristics of the project must be considered having regard, in particular, to:

- the size of the proposed development,
- the cumulation with other proposed development,
- the use of natural resources,
- the production of waste,
- pollution and nuisances,
- the risk of accidents, having regard to substances or technologies used.
2. **Location of proposed development.**

The environmental sensitivity of geographical areas likely to be affected by proposed development, having regard in particular to:

- the existing land use,
- the relative abundance, quality and regenerative capacity of natural resources in the area,
- the absorption capacity of the natural environment, paying particular attention to the following areas:
  
  a) wetlands,
  b) coastal zones,
  c) mountain and forest areas,
  d) nature reserves and parks,
  e) areas classified or protected under legislation, including special protection areas designated pursuant to Directives 79/409/EEC and 92/43/EEC,
  f) areas in which the environmental quality standards laid down in legislation of the EU have already been exceeded,
  g) densely populated areas,
  h) landscapes of historical, cultural or archaeological significance.

3. **Characteristics of potential impacts**

The potential significant effects of proposed development in relation to criteria set out under paragraphs 1 and 2 above, and having regard in particular to:

- the extent of the impact (geographical area and size of the affected population),
- the transfrontier nature of the impact,
- the magnitude and complexity of the impact,
- the probability of the impact,
- the duration, frequency and reversibility of the impact.
4. Screening Assessment

4.1. Characteristics of Proposed Development

4.1.1. Size of the proposed development

The proposed Galway Bay Marine and Renewable Energy Test Site will be located at the existing ¼ scale wave energy test site, situated on the north side of Galway Bay, 1.3 km south of the north shore of the bay and 2.4 km east southeast of Spiddal, Co. Galway (Figure 1). Spiddal is located 19 km west of Galway City.

![Figure 1: Location of the existing Galway Bay ¼ Scale Wave Energy Test Site in Galway Bay](image)

The area of the proposed Galway Bay Marine and Renewable Energy Test Site will be the same as the existing ¼ scale wave energy test site, at 37 hectares and located in water depths of 21-24 metres.

Its east-west extent is approximately 670 m and its north-south extent approximately 560 m. Existing infrastructure on the site consists of navigation markers on the four corners of the quadrilateral of water demarcating the site, a wave rider databuoy, an acoustic monitoring...
buoy, and the SmartBay data buoy. A cable to shore has recently been installed under Foreshore Licence No. 2014/02786. The co-ordinates of the four corners of the site are:

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>North West</td>
<td>53° 13.90’ N</td>
<td>9° 16.15’ W</td>
</tr>
<tr>
<td>North East</td>
<td>53° 13.90’ N</td>
<td>9° 15.55’ W</td>
</tr>
<tr>
<td>South West</td>
<td>53° 13.60’ N</td>
<td>9° 16.15’ W</td>
</tr>
<tr>
<td>South East</td>
<td>53° 13.60’ N</td>
<td>9° 15.55’ W</td>
</tr>
</tbody>
</table>

4.1.2. Long Term Infrastructure

In developing and upgrading the Galway Bay Marine and Renewable Energy Test Site the Marine Institute propose to install specific infrastructure at the site to improve the service offered to end-users. The following list details the proposed long term deployments at the site.

4.1.2.1. Cardinal Marks

Figure 2: Example cardinal marks used elsewhere.

The purpose of the four cardinal markers is to delimit the extents of the proposed Galway Bay Marine and Renewable Energy Test Site and to ensure for safe navigation around the site by vessel users in Galway Bay. The four cardinal marks will be moored to the seabed by means of a single point chain mooring affixed to a 2 tonne clump weight. The four cardinal marks will be permanently deployed at the corners of the test site. The installation of the cardinal marks will be the subject of an application to Commissioners of Irish Lights for sanction of alteration to existing aids to navigation.

Approximate dimensions:
- Hull: 3m diameter x 2m draft.
- Height: 7m
- Weight: 2 tonne anchor weight
4.1.2.2. **Cable End Equipment (CEE) and frame**

The Cable End Equipment is the collective term for the sensors, instruments, communication and expansion ports that will receive power and communications from shore. Connections to the Galway Bay Cable and downstream instruments will be made via bulkheads and dry mate connectors.

The CEE will provide 400V DC (3.5kW) power supply to the sensors, SeaStation, Wave Energy Converters (WECs) and High Definition Television (HDTV) cameras.

**Figure 3: CEE Frame schematic**

The CEE frame will be deployed on the seabed and anchored under its own weight. The CEE frame will be permanently installed in the southwest corner of the Galway Bay Marine and Renewable Energy Test Site.

Approximate dimensions: CEE Frame 3m x 1.5m x 1.7m (length x width x height)
Weight: 1.5 tonne

4.1.2.3. **Waverider data buoy**

The purpose of the waverider data buoy is to continually monitor the wave climate at the proposed Galway Bay Marine and Renewable Energy Test Site.

The waverider data buoy is moored to the seabed by means of a single point rope mooring affixed to a 0.5 tonne clump weight.

The waverider data buoy is permanently deployed at the western edge of the test site and has a short range navigation light affixed.

**Figure 4: Waverider buoy.**

Approximate dimensions: Buoy: 0.9m diameter
Weight: 0.5 tonne anchor weight
4.1.2.4. SeaStation platform

Figure 5: Schematic arrangement of CEE Frame, SeaStation, and WEC.

The SeaStation platform will be a floating platform moored within the test site boundaries which will house a power dissipation system, allow connections to the shore cable via the Cable End Equipment (CEE), and connection for up to three energy converters via separate umbilical cables. The primary purpose of the SeaStation is to emulate the grid for developers so that they can accurately test their marine renewable energy prototypes.

It is anticipated that the actual SeaStation will occupy an area on the surface similar to a small vessel (25m x 8m) or test rig (12m x 12m) for example.

It is envisaged that the SeaStation will be moored to the seabed by means of four two-point chain moorings (one two-point mooring off each corner), each affixed to a 2 tonne high hold anchor such as a Danforth. It is intended that the platform will be deployed on a year-round basis with recovery of the platform only occurring for scheduled annual maintenance.
4.1.2.5. **Gravity Base**

The gravity base will be constructed using an interlocking modular frame assembly. Each interlocking frame will be capable of containing prefabricated concrete weights, to a maximum weight of 9 tonnes. Deployment of individual 9 tonne frames or a series of interlocking 9 tonne frames will be dependent on the specific mooring requirements of any device to be deployed.

Approximate dimensions:  
Frame: 2.5m x 2.5m x 2m (length x width x height)  
Weight: min: 9 tonne, max (full connected system): 54 tonne.

4.1.3. **Recurring Short Term Infrastructure**

In addition to the long term infrastructure detailed above, a range of recurring shorter term infrastructure will be deployed at the proposed Galway Bay Marine and Renewable Energy Test Site to support device developers and researchers. The following is an indicative list of the recurring short term deployments to the site.

4.1.3.1. **SmartBuoy data buoy**

![Figure 6: Service visit to SmartBay SmartBuoy.](image)

SmartBay Ireland Ltd., on behalf of the Marine Institute, currently manage the existing ¼ scale wave energy test site for the development of innovative products and services for the global maritime sector. The SmartBay SmartBuoy was deployed on April 15th 2014. The Mobilis DB800 buoy was configured with an array of sensors that allow the collection and monitoring of environmental data on the test site.
The SmartBuoy undertakes short term deployments on a regular basis to support ocean energy device developers and for the testing of ocean energy components and marine technology solutions. The SmartBuoy can have single, bridle, or multipoint rope, wire or chain moorings through the hull compartment affixed to 1 tonne clump weights thus allowing for diverse and easily adaptable deployment solutions depending on specific requirements.

Approximate dimensions: Hull: 3m diameter x 2m draft. Height: 7m Weight: 1 tonne anchor weight

4.1.3.2. Acoustic Array

Figure 7: Schematic of Acoustic Array deployed around WEC

The Acoustic Array addresses an identified need for monitoring the objective noise levels of ocean energy devices and the presence of cetaceans and other sealife for environmental assessment studies which are required by regulatory agencies. It is intended that the Acoustic Array will be deployed at the existing wave energy test site in Spring 2016 for a series of in-water tests prior to commissioning. Thereafter the Acoustic Array can be deployed when devices are deployed on the site.

The Acoustic Array consists of a system of six individual landers containing two acoustic monitoring hydrophones and a particle velocity sensor. The six landers are connected via 17mm diameter cabling to a central hub (containing the associated electronics and ICT
components) which in turn is connected via a 25mm diameter cable directly to the Cable End Equipment (CEE).

Approximate dimensions: 

- **Landers:** triangular base of 1m side x 0.75m height
- **Lander weight:** 0.1 tonne
- **Cable lengths:** 1 x 160m, 2 x 400m, 3 x 300m
- **Hub:** 0.5m diameter x 1.2 m length
- **Hub weight:** 1 tonne
- **Hub to CEE Cable:** 1 x 150m

4.1.4. Test and Demonstration Devices

The proposed Galway Bay Marine and Renewable Energy Test Site has been designed to support device developers and researchers. The types of devices that could be deployed include ocean energy converters & components, marine technology test and demonstration experiments, scientific instrumentation and sensors. The following is a list of device deployments to the site in the past, and an indicative outline of proposed devices for the coming years.

4.1.4.1. Oscillating Water Column WECs


Figure 8: OE Energy Buoy testing at the ¼ Scale wave energy test site (2007 – 2011)

The oscillating water column WEC is a partially submerged, hollow structure, which is open to the sea below the water surface so that it contains air trapped above a column of water. Waves
cause the column to rise and fall which compresses and decompresses the trapped air. Energy is extracted from the oscillating air flow using an air turbine (which is out of the water). Generally moored with a three/four point chain mooring affixed to embedment anchors.

Deployment: 5 months, 15 months & 3 months  
Dimensions: 6m width x 12m length  
Weight: n/a, floating

**GRS Power Platform** - *propose to deploy in Galway Bay 2016*

![Figure 9: Schematic of GRS power platform](image)

The GRS Power Platform typically comprises of six oscillating water column wave energy generators and an optional wind turbine. A typical configuration consists of:

- 6 x 1 MW OWC wave generators
- 1 x 3 MW wind turbine

The Power Platform structure is positioned one to three kilometres offshore and fixed on the seabed in a minimum water depth of 20 to 40m. The weight of the in-place steel structure is expected to be 300 tonnes, distributed in three leg bases which will be sitting on the seabed. The footprint of the entire device will be 338m². The device will be supported by three legs with each of the legs having a footprint of 36m².

Deployment: 6 months  
Dimensions: triangle with sides of 26m x 8m height  
Weight: unknown at this time
4.1.4.2. Point Absorber WECs

WaveBob – (deployed in Galway Bay 2006 – 2007)

Figure 10: Wavebob Wave Energy device testing at the ¼ Scale wave energy test site (2006 – 2007)

This is a floating structure which absorbs energy in all directions through its movements at or near the water surface. The movement of the waves causes the floating part to move relative to a fixed structure. It has small dimensions compared to the typical wavelength, tending to have diameters of a few meters and has the capacity to absorb energy from the sea area larger than the device dimensions. This type of device is typically axisymmetric. Generally moored with a two/three point mooring affixed to embedded anchors.

Deployment: 10 days, 3 months, 3 months
Dimensions: 5m diameter
Weight: n/a, floating
Sigma Energy – (propose to deploy in Galway Bay 2016)

Sigma Energy's WEC is a point type wave power plant which transforms, by an original mechanical PTO system, the vertical motion of the circular floating buoy due to waves into the electric energy.

Sigma Energy developed an original circular float design with an open bottom and system of unidirectional valves. Float is connected to the spar by specially constructed and patented spherical joint. The spar is supported by a tension leg platform with three tendons of equal length, so it remains vertical throughout the motion.

There is an original patented procedure for deployment of the tension leg platform and the float at the chosen location.

**Figure 11: Sigma Energy schematic**

- **Deployment:** 15 months
- **Dimensions:** 6m diameter buoy, 2m depth with 12m stem below surface.
- **Weight:** n/a, floating
**Wave Pump**  (propose to deploy in Galway Bay 2016)

Benson Engineering's WEC is a point type wave power plant which transforms the vertical motion of the circular floating buoy due to waves into the electric energy.

The device consists of a floating buoy structure with 2 point taught mooring to a gravity base structure.

Deployment: 18 months  
Dimensions: 4m diameter, 1.25 m height  
Weight: n/a, floating

![Wave Pump](image)

Figure 12: WavePump

4.1.4.3. **Attenuator WECs**

**SeaPower Platform**  (propose to deploy in Galway Bay 2015-2016)

![SeaPower Platform](image)

Figure 13: Artist impression of SeaPower Platform

The SeaPower Platform, is made up of 3 large hollow concrete floating pontoons hinged together. The platform, although of large overall displacement, has a shallow draught. It also
has a low visual profile above the waterline. The mechanical/electrical/hydraulic PTO systems are mounted on deck and the stiff concrete hulls ensure that noise will be minimal. The device is slack-moored by means of four point moorings to standard sea-bed anchors.

Deployment: 24 months
Dimensions: 17m x 5m x 2m depth (0.6m draught).
Weight: n/a, floating

**Perpetuwave Power** – *(propose to deploy in Galway Bay 2015-2016)*
Similar to the SeaPower platform, a hinged platform with a 4 point mooring to anchors.

Deployment: 12 months
Dimensions: 15m x 6m x 3m (0.3m draught)
Weight: n/a, floating

### 4.1.4.4. Oscillating Wave Surge Convertors WEC
Oscillating wave surge converters (OWSCs) are a class of wave power device that exploits the horizontal movement of waves in the nearshore coastal zone with water depths of 10–20 m. OWSCs predominantly oscillate horizontally in surge as opposed to the majority of wave devices, which oscillate vertically in heave and usually are deployed in deeper water.

![Figure 14: Typical OWSC devices](image)

Example developers include Aquamarine Power, AW Energy and Resolute Marine Energy. The devices are mounted on the seabed using gravity bases. Most of the devices are all subsea with some devices having only top of flap above water line.

Typical dimensions of scale devices: <10m wide x <10m high x <5m long.
4.1.4.5. Other Floating Devices

**TetraFloat** - (previously proposed to deploy in Galway Bay 2016)

The TetraFloat concept was conceived and patented in November 2008. TetraFloat is a floating structure designed to house a conventional wind turbine. The device designed for Galway Bay will be of 1:5 scale.

TetraFloat’s objectives are two fold: (a) to observe how a larger-scale TetraFloat object behaves in real random-wave conditions over an extended period of time and (b) to demonstrate to those interested in offshore wind that this platform can deliver all of the required functionality for a floating platform.

The device will be moored by means of a single point catenary mooring.

**Figure 15: TetraFloat schematic**

Deployment: 2 weeks
Dimensions: 20m high x 20m length x 17m width (12m blade tip diameter)
Weight: n/a, floating
4.1.4.6. **Marine Technology**

**Seatronics Power Harvesting System** – (propose to deploy in Galway Bay 2016)

![Artist impression of Seatronics Power Harvesting System](image)

Figure 13: Artist impression of Seatronics Power Harvesting System

The Seatronics device consists of an omni-directional turbine that can generate power from ocean currents as low as 0.1 m/s. The device supports multiple sensors and has been designed for wide area, real-time, environmental monitoring. The device is deployed on the seabed without moorings or external anchoring.

Dimensions: 1.8m diameter base, 2.5m height, 1.5m diameter turbine

Weight: 0.5 tonne

4.1.5. **Cumulation with other proposed development**

The proposed Galway Bay Marine and Renewable Energy Test Site is located 1.3km offshore of the County Galway coastline, and 2.4km over water in an east-southeast direction from Spiddal. Consequently, significant cumulative effects with any proposed on-shore developments are not considered likely.

The proposed Galway Bay Marine and Renewable Energy Test Site will connect to the Galway Bay Cable, a subsea fibre optic cable providing a 3.5kW power supply and data transmission facility running from a shore-based location in Spiddal to the Cable End Equipment to be located within the existing test site.
The purpose of the proposed Galway Bay Marine and Renewable Energy Test Site with the Galway Bay Cable is to establish a national shared marine research, test and demonstration facility to catalyse and facilitate, through research, the commercial development of renewable technologies, environmental monitoring instrumentation and other marine technologies.

4.1.6. Use of natural resources
The proposed Galway Bay Marine and Renewable Energy Test Site will be used by marine renewable energy devices to harness the natural resource of the waves and tidal currents passing through the test site lease area. Based on data from usage of the site by device developers to date there will be no detriment to the natural wave or tidal resource in the area arising from the proposed development.

4.1.7. Production of waste
The proposed Galway Bay Marine and Renewable Energy Test Site will not generate any waste products during development or operation.

4.1.8. Pollution and nuisance
The proposed Galway Bay Marine and Renewable Energy Test Site will not generate any pollutants.

4.1.9. Risk of accidents, having regard to substances or technologies used
The risk of accidents associated with the development of the Galway Bay Marine and Renewable Energy Test Site is considered to be minor and not significant. Any impacts would temporary and localised would not cause unusual, significant or adverse effects on the marine environment.

4.2. Location of Proposed Development
The proposed Galway Bay Marine and Renewable Energy Test Site will be located at the existing ¼ scale wave energy test site, situated on the north side of Galway Bay, 1.3 km south of the north shore of the bay and 2.4 km east southeast of Spiddal, Co. Galway. Spiddal is located 19 km west of Galway City. (see Figure 1 previous).

The proposed Galway Bay Marine and Renewable Energy Test Site is not located within any designated, nor protected, sites under EU or Irish legislation. The nearest such sites are the
Black Head – Poulsallagh SAC site located approximately 7.5km to the south, the Galway Bay Complex site and the Inner Galway Bay site both located approximately 9km to the east of the proposed Galway Bay Marine and Renewable Energy Test Site. The designations of the aforementioned sites are detailed below (Table 1).

<table>
<thead>
<tr>
<th>Designated Area</th>
<th>Site Code</th>
<th>SAC</th>
<th>NHA</th>
<th>SPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Head – Poulsallagh</td>
<td>IE000020</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Galway Bay Complex</td>
<td>IE000268</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Inner Galway Bay</td>
<td>IE004031</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1: Designated Protected Areas

A Natura Impact Statement is being prepared which will present details of the analysis of any potential effects on the above site arising from the development of the proposed Galway Bay Marine and Renewable Energy Test Site.

4.2.1. Existing land-use

Seabed

The existing use of the site identified for the proposed Galway Bay Marine and Renewable Energy Test Site has been the ¼ Scale Wave Energy Test Site since 2006. In 2007 a geophysical and hydrographic survey was undertaken that encompassed the site. In 2009 the Marine Institute’s Advanced Mapping Section produced a report on the survey with reference to the ¼ Scale Wave Energy Test Site (Appendix 1). The following description of the site is extracted from that report.

Water depths in the site are approximately 21 m with little variation over the entire site. The seabed slope in the site area is very gentle with a gradual deepening from north to south. The seafloor topography in the test site can be broadly designated as having very low relief with a very gentle slope. There is evidence of bedrock outcrop located to the north of the test site.

Multibeam backscatter data was used to indicate the relative hardness of the seafloor. Uniform low reflectivity backscatter facies was present in the test site area and was interpreted to be mud and fine sand. High reflectivity backscatter facies was located in the north of the area and indicates bedrock outcrop. This facies was not found within the test site boundary.
The shallow geology in the test site was interpreted from the sub-bottom profiler data. As no ground-truthing of sub-bottom profiler data was undertaken at the time, unit compositions were on a tentative basis only. A clearly defined horizon was evidenced across the site between 2.3 and 3.3m beneath the seabed. The material above this horizon comprises acoustically featureless soft sediment, interpreted to be mud and fine sand. Beneath the horizon is material interpreted to be glacial till or gravel.

4.2.2. Abundance, quality and regenerative capacity of natural resources in the area

Wave Resource

Wave data has been collected by the Marine Institute at the ocean energy test site since 2006 using a wave rider buoy (IMOS, 2012). Between November 2006 and November 2007, the average wave heights ranged from 1.3m in the winter months to 0.3m in the summer months. The maximum wave height measured during the same period was over 8m (December 2006). During the winter months, over 30% of the waves measured over 2m in height.

More recent waverider buoy data based on a 3 year period from May 2008 to April 2011 (IMOS, 2012). Results indicated an average wave height of 0.75m with waves exceeding 2.5m occurring in many months during the year. The greatest percentage of waves exceeding 2.0m in height occurred in January and November (~4%-8%).

Benthic Habitat

In September 2009, AquaFact conducted a marine environmental appraisal of the existing test site, on behalf of Hydraulics and Maritime Research Centre, and sampled at a total of 6 stations; 5 stations within the existing test-site lease area and at one control station approximately 650m south of the test-site (Figure 16). The following description of the test-site is extracted from the AquaFact report, included as Appendix 2.

Taxonomic identification of the benthic infauna across all 6 stations sampled in the ocean energy test site in inner Galway Bay yielded a total count of 117 species accounting for 1,746 individuals, ascribed to 7 phyla. Of the 117 species enumerated, 56 were polychaetes (segmented worms), 31 were crustaceans (crabs, shrimps, prawns), 18 were molluscs (mussels, cockles, snails etc.), 6 species were echinoderms (brittlestars, sea cucumbers), 2
species were cnidarians (sea anemones, corals), 2 species were sipunculids (peanut worms) and 1 species was a phoronid (horseshoe worm).

The dominant species from this survey were the polychaetes Tharyx sp., Scalibregma inflatum, Spiophanes kroyeri, Glycera alba, Spiochaetopterus typicus, Chaetozoan setosa, the amphipod Photis longicaudata and the molluscs Thyasira flexuosa and Phaxas pellucidus. Species richness and evenness was high at each station.

Sediment Profiling Images indicated a healthy Stage community present at the site with both infaunal and epibenthic (decapods) species reworking and oxygenating the upper ca 15 cms of sediment to such a degree that no discontinuity in oxygen levels were noted on any of the images collected.

This appraisal established baseline benthic fauna present at the test site and found a high level of similarity between the sampled locations and the results of a benthic faunal study carried out by O'Connor & McGrath (1981), suggesting that there has been no noticeable changes in benthic fauna in this area.

Figure 16: Map showing location of sampling stations (AQUAFACT, 2010)
The results of the multivariate analyses indicate a high level of similarity between the sampled locations and suggest that there has been no noticeable change in benthic fauna within the site. This is further supported by the high level of similarity between the “in-site” data and the off-site control.

**Marine Mammals**

In August 2011 and August 2012 the Sea Mammal Research Unit (SMRU) of the University of St. Andrews carried out aerial surveys of seal populations in the north and north-west of Ireland. SMRU was previously involved in a similar survey in August 2003. Comparison of harbour seal numbers between the 2003 and 2011/12 surveys showed increases in population numbers for Galway Bay North (2003 – 49, 2011 – 55), Inner Galway Bay (2003 – 200, 2012 – 221), and Aran Islands (2003 – 39, 2012 – 53). This report is included as Appendix 3.

A recent report on cetacean occurrence at the existing test site undertaken by O’Brien for the Marine Institute reviewed all data on cetacean observations from 2005 to 2012. This report is included as Appendix 4. Findings from Static Acoustic Monitoring surveys from Jan 2009 – Sept 2010 at the test site (with a wave energy convertor on-site) showed harbour porpoises present for 95% of the days monitored, with dolphins present only 4% of the days. Results from two additional monitoring sites 500m and 1000m distance from the test site showed no significant difference in detections between those sites and the test-site.

**4.2.3. Absorption capacity of the natural environment**

The proposed development of the Galway Bay Marine and Renewable Energy Test Site is to take place on the existing leased test-site area. This site is not located within any designated or protected sites. The area has accommodated the operation of the existing test site since 2006.

The report by AquaFact (Appendix 2) found a high level of similarity between the sampled locations and the results of a benthic faunal study carried out by O’Connor & McGrath (1981), suggesting that there has been no noticeable changes in benthic fauna in this area due to the operation of the test-site.

The report by Duck et al (Appendix 3) found an increase in harbour seal population numbers in Galway between 2003 (before test-site establishment) and 2012 (during operation of test-site).
The report by O'Brien (Appendix 4) found that the existing test site location is used as a foraging site by harbour porpoises. Results from static acoustic monitoring surveys during wave energy device trials on the site failed to show any significant differences in detections of harbour porpoises between on-site and off-site locations.

The above studies and findings support the argument that the proposed development of the Galway Bay Marine and Renewable Energy Test Site will not have any significant effect on the absorption capacity of the natural environment at this location.

4.3. **Characteristics of Potential Impacts**

4.3.1. **Extent of the impact (geographical area and size of the affected population)**

As with any offshore operation there will be environmental impacts during installation and removal of various components.

During installation sound emissions would be caused by the operation of vessels and any cranes used for deployments, and also at touch-down of various components onto the seabed. Sediments in the immediate vicinity of any moorings may be compacted to some extent during the installation operations.

The area of foreshore directly affected by the proposed Galway Bay Marine and Renewable Energy Test Site would be highly localised to the footprint of any anchor or mooring deployed on the seabed. There would be no impacts to the foreshore beyond the area of the site.

4.3.2. **Transfrontier nature of the impact**

This is not relevant to this project.

4.3.3. **Magnitude and complexity of the impact**

During installation operations, the magnitude of noise emissions from vessels and cranes would be of the same magnitude as those from the normal operation of large fishing vessels transiting through Galway Bay, or deploying trawls, pots or fishing nets. The impact on the seabed sediments associated with the deployment of moorings or anchors would be of the same magnitude as those from the normal operation of large vessels anchoring offshore in Galway Bay. The magnitude of any potential impact would be imperceptible to slight.
4.3.4. Probability of the impact

The probability of the potential impact would be high, as any device to be deployed at the proposed Galway Bay Marine and Renewable Energy Test Site would require anchoring or mooring to the seabed.

4.3.5. Duration, frequency and reversibility of the impact

The total number of marine renewable energy devices deployed at the site at any one time will be limited by the area of the site. The maximum number of devices will be three.

It is foreseen that any devices deployed for testing and demonstration purposes will require the installation of uniquely designed moorings or anchors. It is planned that all moorings, anchors, and fixings associated with the device will be removed from the test-site area upon completion of the testing of the devices unless it is deemed to be more environmentally advantageous that they remain in position.

The duration of potential noise related impacts associated with vessel operations and the deployment of moorings or anchors would be very limited and only of the order of hours. The frequency of potential noise impacts would be once or twice a year. The duration of potential impacts related to sediment disturbances associated with the deployment of moorings or anchors would be of the order of hours. The frequency of potential impacts would be once or twice a year. Given the dynamic nature of the seabed in the vicinity of the proposed site, the impacts on the seabed would be naturally reversed due to mobilisation of the bed sediments due to wave action and storm events.

5. Assessment Findings

The proposed development of the Galway Bay Marine and Renewable Energy Test Site is located at the existing leased ¼ scale wave energy test-site location in Galway Bay which has been in operation since 2006.

The test site is not located within any designated European or nationally protected sites, nor designated shellfisheries areas. The development is not of Class specified in Part I or Part II of Article 24 of the European Communities (Environmental Impact Assessment) Regulations 1989 to 1999. There will be no construction nor demolition works associated with the
development of the site. The deployment of any devices at the test-site will be short term and temporary. The deployment of scientific instrumentation at the test-site and ancillary cabling, while of longer duration that any devices, will be used to constantly monitor the environmental conditions at the site.

Recent studies in 2009 have shown little change to the benthic faunal communities at the site since previous study in 1981. Recent studies in 2013 have shown little change to the marine mammal communities in Galway Bay over the past ten years.

Any potential impacts associated with the proposed development are considered to be of a very short term nature, infrequent in occurrence, reversible and of imperceptible impact when compared to the background natural marine environment.

In terms of the location of the proposed Galway Bay Marine and Renewable Energy Test Site, and based on the preliminary assessment of the environmental sensitivities of the site, it is considered that the proposed development will have a neutral impact on the environment.

6. Conclusion

The Marine Institute are of the opinion that having considered the proposed development of the Galway Bay Marine and Renewable Energy Test Site in context of the criteria set out in Schedule Three of the EIA Regulations and in Annex III of the European Union Environmental Impact Assessment Directive, the proposed development will not have a significant effect on the environment by virtue, inter alia, of its nature, size or location and thus does not consequently require an EIS.

The Marine Institute do propose to undertake adequate consultation with relevant government agencies, environmental bodies and local stakeholders generally to determine the scope of a detailed Environmental Report to submit as part of the foreshore lease application process.
7. Consultation Response

The Marine Institute seeks a formal screening opinion on the above document for the proposed Galway Bay Marine and Renewable Energy Test Site.

All responses should be sent directly Mr Alan Berry at the following address:

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References


List of Appendices

Appendix S1 - Marine Institute Wave Energy Test Site_2009 Survey

Appendix S2 - AQUAFACT Appraisal of Test Site

Appendix S3 - DUCK_Harbour Seal Survey

Appendix S4 - O'BRIEN_Cetacean Survey