FaB Test

Falmouth Bay Test Site
Marine Renewables Commissioning Site

FHC/FT/105

Guide to Deployments
&
Application Process Requirements

Amalgamating documents
FHC/FT/101, FHC/FT/103, FHC/FT/105

Falmouth Harbour Commissioners

University of Exeter

Document Control Register

Issue	Amendment	By	Date
1	Original release	DNP	30/11/2011
2	Appendices added	DNP	08/12/2011
3	Order amended	DNP	22/12/2011
4	Whole document and appendices amended	HW	07/02/2012
5	Further amends	HW	24/02/2012
6	Updates in line with lease and licence changes	AW	02/05/2014

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Background & Regulation

FaBTest offers a uniquely pre-consented test site to marine energy convertor (MEC) device developers seeking a short term test site for eligible devices / sub-systems.

See document FHC/FT/104 Description of Site Characteristics and Eligible Test Installations.

Falmouth Harbour Commissioners (FHC) hold a Marine Licence issued by the Marine Management Organisation (MMO) which licenses certain MEC development test works according to set procedures and conditions. Similarly, FHC has a seabed lease agreement with The Crown Estate (TCE) allowing the use of the seabed, again according to certain procedures and conditions.

The procedures detailed within this document reflect the agreements described above and allow FHC to allocate test berths within the site according to the details contained within the pre-existing agreements and licences.

The FaBTest site is administered by Falmouth Harbour Commissioners supported by a steering group with representatives from industry, academia, agencies and other stake holders. The steering group is divided into two sub-groups, a core group further named as the 'Regulatory Body' and the industrial group. The task of the steering group is to make strategic decisions related to the utilisation and success of the FaBTest site.

The Regulatory Body has two permanent members, Falmouth Harbour Commissioners (FHC) and the University of Exeter (UoE). The specific task of the Regulatory Body is to implement a diligence process to establish that each specific FaBTest installation proposal meets with the requirements according to the Marine Licence, FHC regulations, The Crown Estate (TCE) lease and good practice in accordance with stakeholder expectations. In so doing the Regulatory Body advises and informs the decision of FHC to approve or decline an application for a berth at FaBTest.

The diligence process includes reviews of the following:

1. Application form
2. General overview of the project
3. Engineering assessment & general arrangement drawing
4. Independent validation of the mooring design
5. Quality, Health, Safety and Environment (QHSE) management plan
6. Project execution plan

7. Decommissioning plan
8. Emergency response plan
9. Navigational risk assessment
10. Seabed habitat risk assessment
11. Environmental risk assessment
12. Proposal for noise monitoring
13. Description of any deviation from the Specification for Navigational Safety
14. Insurances
15. Security bonds

The diligence process is required for each specific installation and is conducted through an assessment meeting chaired by FHC. The Regulatory Body assessment meeting will be held within three weeks of receipt of a full application to berth at FaBTest.

In addition to the Regulatory Body members, an independent representative from the local office of the MMO is invited to attend each Regulatory Body assessment meeting. Based on the outcome of the assessment meeting, FHC will authorise or refuse a berthing application. In the case of a refusal, details of any deficiencies will be reported back to the applicant to assist with a subsequent re-submission.

Procedure Overview

See Appendix 1 – Programme Overview Diagram

Pre-application Stage – discussions with the FaBTest team

1. Prospective applicant (PA) reads document FHC/FT/104, Description of Site Characteristics and Eligible Test Installations. PA ensures that the envisaged test deployment is compatible with the test site.
2. PA reads FHC / FT / 105, Guide to Deployments, and discusses deployment with FaBTest team
3. PA selects preferred water depth / bottom type and elects a provisional position.
4. PA completes provisional booking form – Appendix 2 and sends to FaBTest
5. Pre-application meeting arranged.

Pre-application Meeting

6. PA liaises with FHC to verify availability / suitability of the provisional position for the intended test duration. Provisional position is adjusted as necessary.
7. FHC will ensure that a prospective applicant is informed of the requirements pertaining to insurances, a financial bond and the provision of certain data relating to the test and H&S.
8. The Regulatory Body and the applicant discuss the provision of noise monitoring according to the license conditions.
9. PA liaises with the FaBTest Regulatory Body to verify the suitability of the provisional position with regard to the seabed habitat risk assessment (FHC and UoE currently constitute the FaBTest Regulatory Body).

Note: Actions 2, 3 and 6 may form an iterative process.

10. PA completes Application Form – Appendix 3

Note: Depending on the mooring system design and in particular the seabed anchoring design, it may be wise for the PA to undertake a detailed seabed / sub-bottom survey of the elected position providing, for example, information on sediment depth, small rocky outcrops, fine resolution bathymetry etc.

Application Stage

11. The applicant proceeds with location specific installation design, planning and validation such that the following documents can be submitted to FHC together with the application:

a) Application Form.

b) General overview of the project giving the peak rated power output of the device, the proposed location of the device, the position / type of the seabed anchors and the intended commencement date / duration of the test.
c) Engineering Assessment Sheet (reproduced as Appendix 4) together with a general arrangement (GA) drawing of the device with its mooring system and a parts list of the mooring system components (providing MBL / SWL).
d) An independent validation of the mooring design with respect to 3rd party risk due to critical failure, provided by a suitably qualified individual / organisation.
e) Quality, Health, Safety and Environment (QHSE) management plan
f) Project execution plan including an installation method statement
g) Decommissioning plan
h) Emergency response plan

Note: Guidance is provided for items d, e, f and g later in this document

i) An independent review of the QHSE plan provided by a suitably qualified individual / organisation.
j) Notification and description of any requested deviation from the Specifications for Navigational Safety (reproduced as Appendix 2 in this document).
k) Risk assessment study detailing risks to the general public emanating from unauthorised access to the moored device. Suitable control measures should be identified e.g. guarding of rotating machinery, signage etc.
l) Risk assessment study detailing risks of pollution to the marine environment from the test installation. Suitable control measures should be identified including the careful selection of any anti-fouling coatings and other potential pollutants.
m) A proposal for the method of compliance with noise monitoring / reporting requirements.

Procedural Stage

12. The FaBTest Regulatory Body meet to scrutinise the submission and commence the following:
    I. A Navigation Risk Assessment in consultation with Trinity House. FHC feed back to the applicant on any additional requirements for marking, buoyage etc.
    II. A Seabed Habitat Risk Assessment as described later in this document & Appendix 7

13. The FaBTest Regulatory Body accepts the proposal or requests any missing information or returns the submission for amendment, highlighting any area(s) where the proposal falls short of the requirements.

14. FHC submits the following items to the MMO for approval: 11(b), GA drawing of installation, installation method statement, 11(g), 11(h) and 12(II.) Seabed Habitat Risk Assessment.
15. The MMO confirm that the proposal falls within the envelope of tests that is pre-approved and that the conditions of the licence will be met.

Note: The MMO promise a four week turn-around for this confirmation.

Administrative Stage

16. The applicant secures suitable insurances as detailed within the letter of agreement. The applicant provides FHC with a copy of the insurance certificate(s) and schedule(s).
17. The applicant places any bonds required by the letter of agreement, to the satisfaction of FHC.
18. The applicant informs FHC of the named contractors and vessels that will commit the works.
19. FHC apply to the MMO for a variation to the licence to include the named contractors and vessels.

Note: The MMO give a next (working) day turn-around for this licence variation.

20. The applicant agrees to the terms of the Letter of Agreement and signs the required copies.
21. The applicant holds and reports on a Hazard Identification Risk Assessment (HIRA) meeting to be attended by senior representatives of all named project contractors.
22. **FHC issues a berthing permit to test the device as described within the application for a period of up to 1 year.**

Notes:

1. ***Where a longer duration is requested at the application stage, FHC can extend the duration of the licence via a variation request. Where an unforeseen extension is required, a secondary permit application should be made.***

2. ***Whereas the maximum rated generating output of any one device is 3MW, the combined maximum rated output of all devices at FaB Test at any one time is also 3MW. This has implications for devices >1MW wishing to occupy a berth for a longer duration.***

Reporting

As a condition of the FEPA consent at FaBTest, a device installation specific environmental monitoring and reporting system is required. A standard format for this environmental monitoring and reporting will comprise studies of underwater noise and the seabed habitat with any specific additional requirements being identified at the Regulatory Body assessment meeting. This action provides feedback into the environmental risk assessment process and serves to improve the wider knowledge of the effects of Marine Energy Converter (MEC) deployments.

Preliminary baseline studies relating to underwater noise and the seabed habitat have been commissioned by the FaBTest Regulatory Body (see Appendix 6 - FaBTest Baseline Studies and Environmental Monitoring). Environmental monitoring is required by the Regulatory Body during each specific deployment as part of the license conditions. Findings of environmental baseline studies and of the environmental monitoring already undertaken at the site will be available to all stakeholders when published.

Engineering Due Diligence

The FaBTest Regulatory Body is required, by conditions of the site consent, to ensure that the engineering risks associated with a MEC deployment have been fully considered by the device developer (or agent thereof) and that such risks are suitably negated by sound engineering and good practice.

The Regulatory Body will not itself perform engineering calculations or modelling but will ensure that an independent validation of the design work has been satisfactorily completed. Certain outcomes from such calculations and models are required to be presented in order that the body can be confident of the engineering processes inherent within the installation design. The Regulatory Body will review the component selection comprising the mooring system with regard to the load case presented and to the seabed type at the proposed location.
A MEC device developer applying for a berth at the FaBTest site must therefore complete and return the Engineering assessment given as Appendix 4.

Environmental Risk Assessment

The FaBTest Regulatory Body will conduct an assessment of the environmental risk associated with each MEC installation. This assessment will have three components:

1. Ensure that the installation conforms to the Rochdale envelope for devices / moorings as described in the Site Characteristics document FHC/FT/104 and the terms of The Crown Estate lease. The following conditions will be verified:

    - Seabed anchoring is achieved by either drag embedment or gravity anchors.
    - Gravity anchors will not have the potential to introduce alien species (will be of steel, concrete or similar and any 'loose ballast' will be fully sealed from the seawater).
    - The MEC does not include any unguarded water turbines that threaten marine mammals or large elasmobranchs.
    - The MEC installation is in accordance with standard pollution prevention controls.

2. Assess the risk to the seabed habitat with regard to the seabed habitat type and the area of seabed that will be disturbed by seabed anchors and mooring chain contact.

3. Identify any specific environmental monitoring and reporting requirements that are additional to those described in section 1 & 2 above.

Assessing the risk to the seabed habitat

Taking information from the MCZ Interactive Map found at www.mczmapping.org, the FaBTest site encompasses five different seabed habitat types. From north to south these are:

1. Low energy rock
2. Maerl beds
3. Subtidal sand gravels
4. Subtidal sand
5. Subtidal mud

It should be noted that the maerl within the FaBTest site is dead maerl gravel rather than living maerl.

Of these five, maerl beds and subtidal sand gravels are shown as 'Habitats of Conservation Interest'. Figure 1 shows the extent of these two habitats within the site together with 5m separated isobaths.

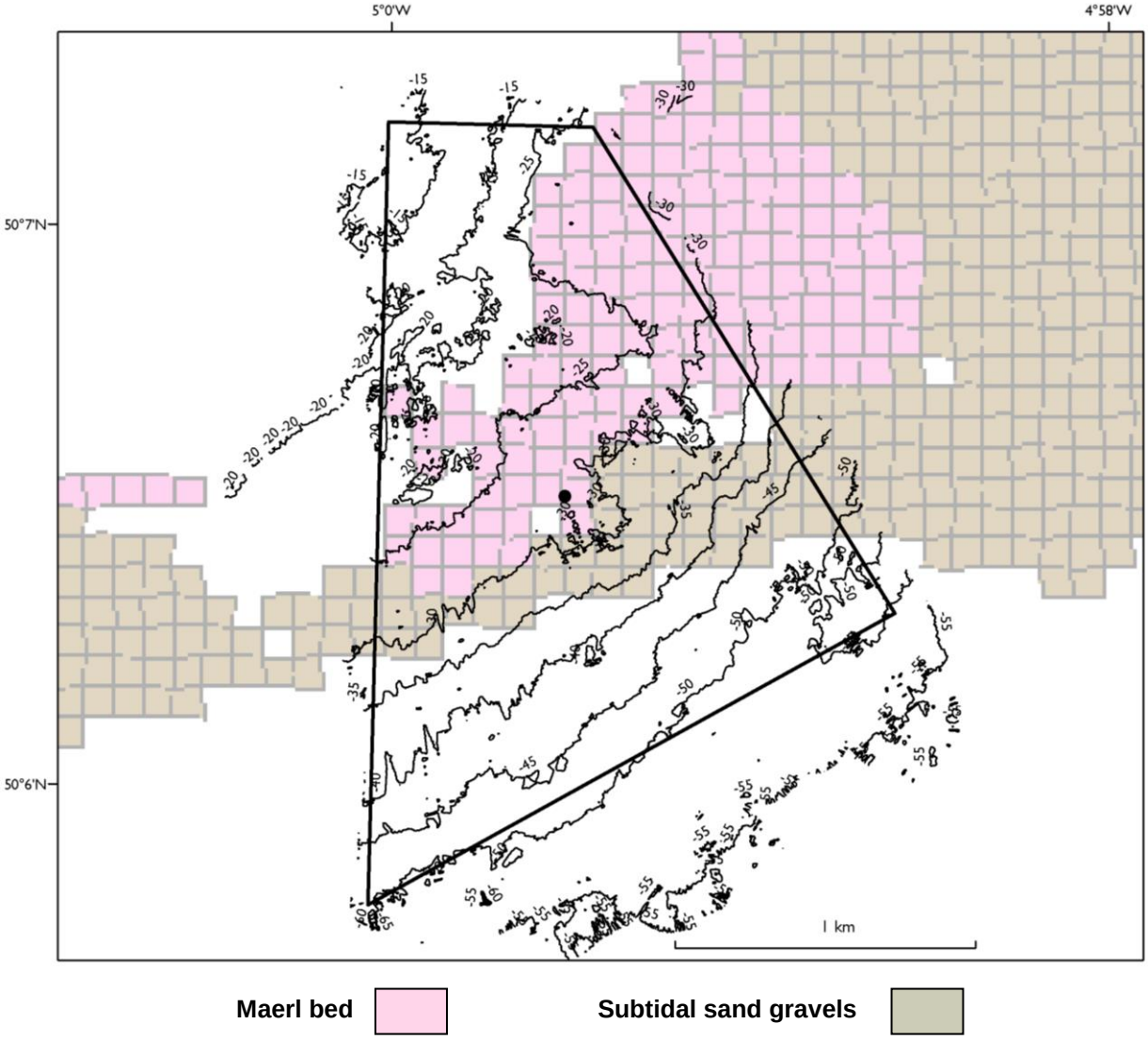

Figure 1: The FaBTest site and seabed habitats of conservation interest.
Source: Defra, Natural England & JNCC via website http://www.mczmapping.org/#

The area to the north west corner is low energy rock with the bulk of the area south of the subtidal sand gravels being subtidal sand with a small area of subtidal mud in the south west corner. In this instance, the environmental risk to the seabed habitat is assessed by relating the sensitivity of the seabed habitat to the area of seabed that will be disturbed by the installation.

The Marine Life Information Network, MarLIN, define sensitivity (for species or habitat) in terms of 'intolerance' and 'recoverability' (MarLIN, (n.d.)). Whilst the sensitivity of species (maerls included) have been assessed, no information can be found which relates the sensitivity of maerl gravel (as a habitat) or subtidal sand gravels and the other habitats within the FaBTest site. Therefore

assumed indices of sensitivity are allocated as follows with the higher index corresponding to the most sensitive habitat:

Table 1: FaBTest assumed seabed habitat sensitivity indices

Seabed habitat	Assumed sensitivity index
Low energy rock	1
Maerl gravel bed	3
Subtidal sand gravels	2
Subtidal sand	1
Subtidal mud	1

The threat to the seabed habitat results from abrasion and disturbance caused by the MECs seabed anchors and mooring chain movement across the seabed. For each MEC installation it is possible to quantify the area of seabed at risk from the threat.
Details of the mooring system, previously reviewed in the engineering assessment, are used to determine this area as detailed in Table 2.

Table 2: Methods for calculating the threatened seabed area

Anchor type	Area at risk
Drag embedment	Width of anchor flukes x estimated drag length x number of anchors + theoretical chain scour sector area x number of anchors x 0.25
Gravity	Footprint area of anchor x number of anchors + theoretical chain scour sector area x number of anchors x 0.25

The chain scour sector represents the lateral swing of a ‘ground chain’ around the anchor point resulting from the MEC maximum excursion as defined in the engineering assessment. With highly directional wave conditions at the FaBTest site (effectively polarised by the near shore bathymetry) it is necessary to consider that significant excursion will only occur in one quadrant (towards the NW) which will limit the area of each limb scour and the number of limbs likely to cause scour. Further, the ground chains subjected to a swing by the excursion are not under high load and do not therefore behave as taught members. For these reasons, to approximate a total chain scour sector for the MEC a factor of 0.25 is applied to the theoretical area which results from the ground chain length and the peak excursion radius (see Figure 2).

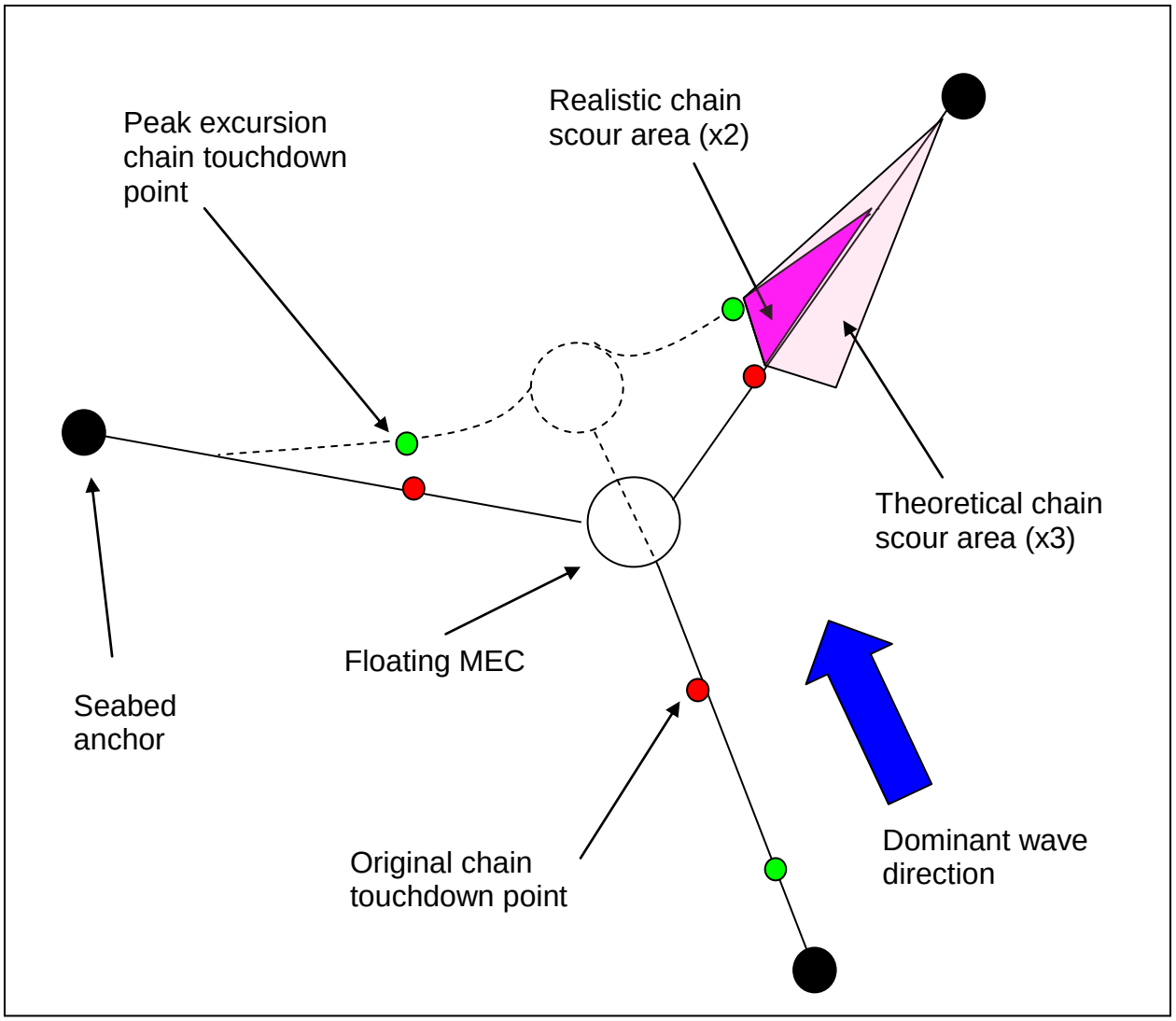

Figure 2: An illustration of realistic chain scour due to excursion

The area calculated to be at risk from abrasion and disturbance is then expressed as a percentage of the total area of that habitat found within the FaBTest site. Subtidal mud accounts for a very small area and is therefore grouped with subtidal sand as shown in Figure 3. The habitat areas are given in Table 3.

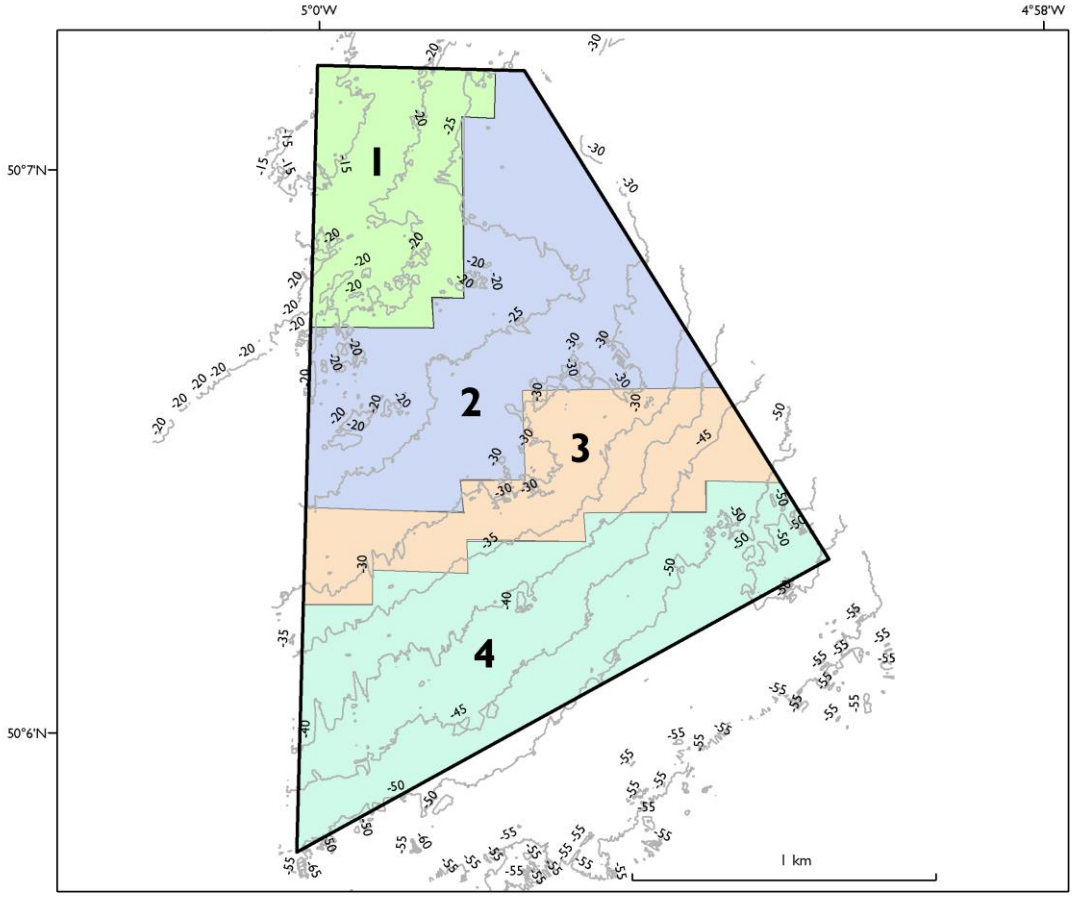

Figure 3: FaBTest habitat area polygons

The percentage of the seabed habitat threatened by the specific MEC installation is expressed by the corresponding index according to Table 4.

Table 3: Seabed habitat areas within the FaBTest site

Seabed habitat	Total area within FaBTest site (m^2)
1. Low energy rock	426,973
2. Maerl gravel	917,595
3. Subtidal sand gravels	479,339
4. Subtidal sand and mud	957,232

Table 4: Seabed habitat area indices

Area condition	Area index
Area < 0.05%	1
0.05% < Area < 0.10%	2
0.10% < Area < 0.15%	3
Area > 0.15%	4

For each specific MEC installation a 'seabed habitat risk factor' is calculated by multiplying the 'habitat sensitivity index' by the 'habitat area index'. If this result gives a seabed habitat risk factor of 6 or less, the risk to the habitat will be deemed to be minimal and allowable. A risk factor of 12 will be indicative of an unacceptably high risk to the seabed habitat and the installation will need to be relocated to a less sensitive habitat within the FaBTest site. Risk factors of 8 and 9 will indicate a borderline condition where a more accurate assessment of the scour area is required to ensure that the correct area index is applied. Subsequent to an accurate assessment of scour area, a risk factor of 8 or 9 will be allowable but device developers will be encouraged to deploy in a less sensitive habitat. These risk factors and outcomes are shown in Figure 4.

	Area index				
		1	**2**	**3**	**4**
Sensitivity index	**1**	1	2	3	4
	2	2	4	6	8
	3	3	6	9	12

Acceptable risk

Accurate assessment required

Unacceptable risk

Figure 4: Seabed habitat risk factors and outcomes

The assessment described above will be recorded on the Seabed Habitat Risk Assessment sheet which is given as Appendix 7.

Note: It is likely that the temporary cessation of benthic trawling / scallop dredging that will result from an installation will provide a positive environmental effect to the seabed area within the moorings footprint. However, since this benefit is difficult to quantify it is not included in this seabed habitat risk assessment.

Navigation Risk Assessment

Falmouth Harbour Commissioners, having regard to navigational safety will conduct an assessment of the risk to navigation presented by each MEC installation. This assessment will have five components:

1. Ensure that the installation conforms to the consents held for the site with regard to marking and lighting. Appendix 4 specifies the 'base case' for marking and lighting a simple device but when necessary FHC will liaise further with Trinity House to agree the marking and lighting format. This is in line with existing practice.
2. Assess the remaining risk to navigation using Hazman hazard management software according to existing FHC practice.
3. Identify and specify any additional measures necessary to achieve navigational safety e.g. supplementary buoyage, again in liaison with Trinity House.
4. Assess any risks posed by deployment vessels working on site, particularly in instances where two or more deployments are to be made concurrently.
5. Review applicant's emergency response plan.

Hazman Hazard Management Software

FHC will undertake the navigation risk assessments using the HAZMAN hazard management software. Hazman is widely used within the ports industry and allows for comprehensive assessments of risk and assessment of the effectiveness of the proposed control measures. Figure 5 shows an example of a hazard input page.

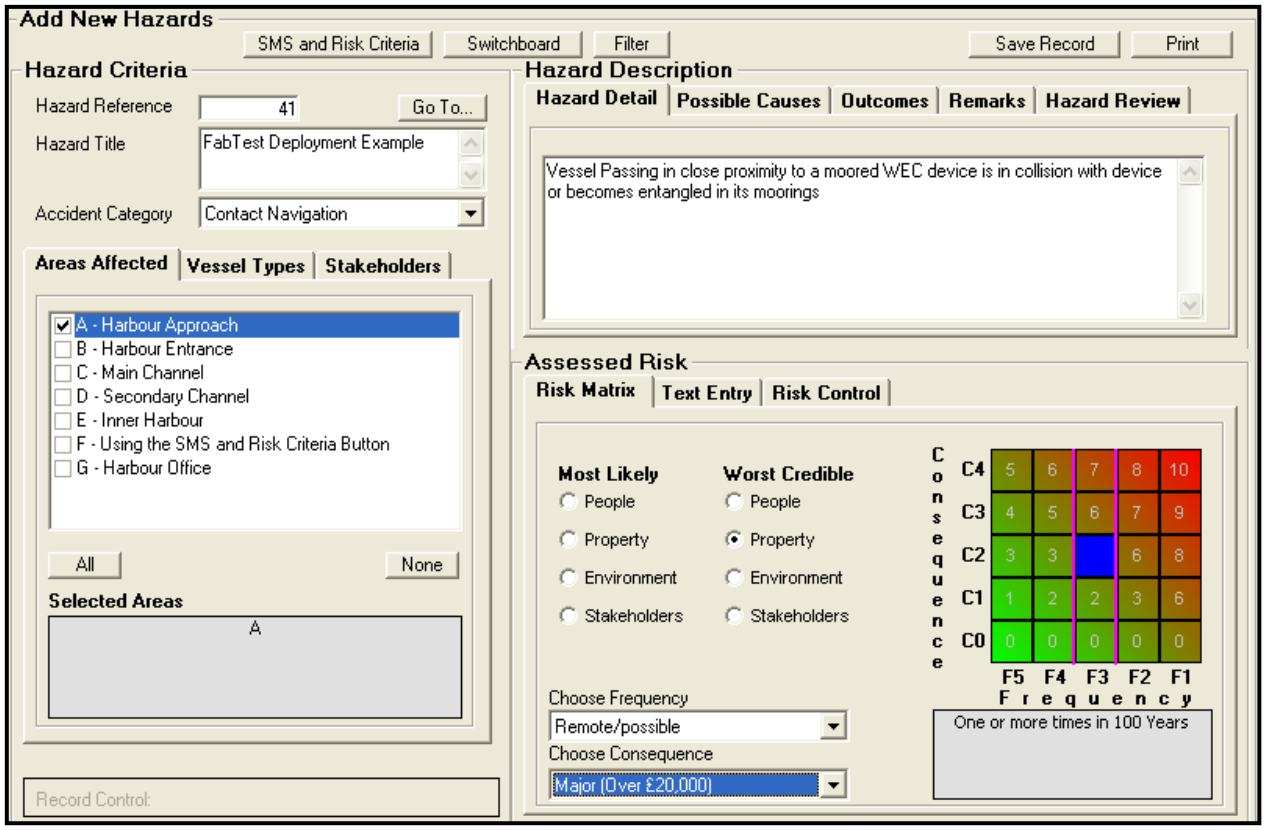

Figure 5: Hazman software hazard input page

Risk control options are entered and their effectiveness in mitigating the risk is assessed. Risk controls will include hardware defences such as buoyage and lighting as well as procedural defences such as notices to mariners and radio broadcasting. The mitigated risk is required to be as low as is reasonably practicable. Figure 6 shows an example of a hazard outcome page

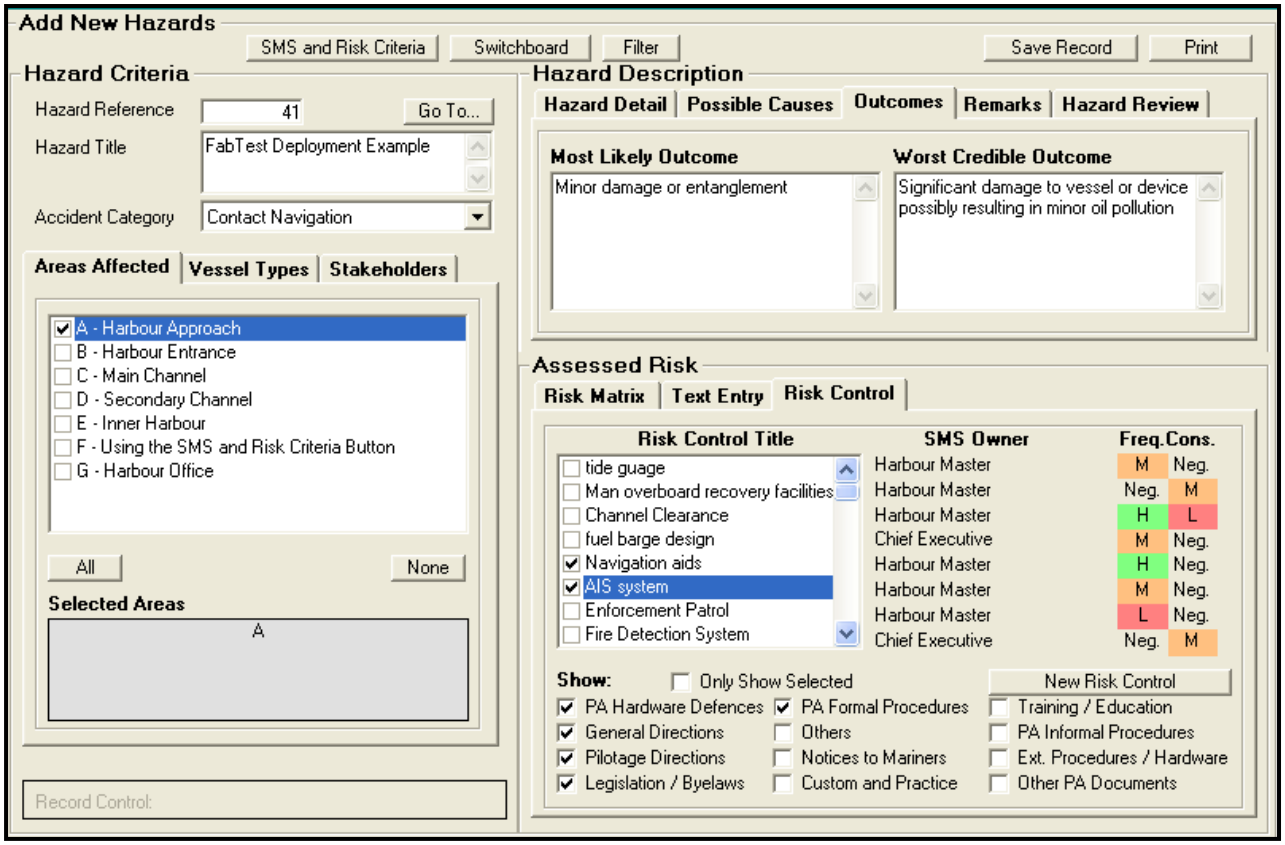

Figure 6: Hazman software hazard outcome page

Project Implementation and Decommissioning Plan

The MEC developer will submit a detailed project implementation and decommissioning plan as part of the permit application process. Such plans should include the sea state / wind strength limitations that apply to the proposed methods. The Regulatory Body will thus ensure that the proposed plans comply with good practice accepted within the industry. It will also ensure that the decommissioning plan allows for the complete removal of all seabed items.

Applicants should consult the Falmouth Harbour Commissioners website and the current edition of the Admiralty List of Radio Signals, to ensure plans include compliance to pilotage requirements.

Insurances

The harbour authority will require all projects to be adequately insured. This will include third party liability insurance and adequate cover for remedial/removal works in the event of a mooring/device failure and/or financial failure of the organisation.

Device owners are required to remove any sunk or wrecked devices from the Site as soon as practicable after the sinking or wreck occurs. They are required to have insurance cover in place against these eventualities which complies with the following;

1. Cover in place to an agreed minimum sum, appropriate to the specific device
2. The policy is to name Falmouth Harbour Commissioners as first party insured
3. The name of the Insurance Company is submitted with the first application
4. A copy of the policy is to be provided prior to issue of the permit
5. A bank guarantee or bond is to be provided for any deductible stated in the policy
6. Evidence is to be provided of payment of premium
7. The owner warrants that the policy shall not be cancelled whilst the device is deployed. Falmouth Harbour Commissioners interest shall be noted on the policy
8. The cancellation of the policy whilst the device is deployed shall cause the permit to be rescinded. The bond or bank guarantee shall also become immediately payable

Data Collection and Availability

Conditions of the marine consents and The Crown Estate lease require that certain environmental and operational parameters are measured, recorded and reported to these bodies. This obligation on FHC / FaBTest is transferred via the berthing permit to those developers berthing at FaBTest. In order that the environmental data requirement poses a minimal additional workload to device developers and for uniformity of data format / presentation, the University of Exeter is usually able to provide the necessary instrumentation at FaBTest to satisfy these requirements. Berthing applicants may liaise with representatives of UoE to discuss this arrangement which might necessitate the use of a non-disclosure agreement and a contribution to the costs of data collection.
The data required is as follows:

1. Noise assessment of the MEC - this to be normalised against wave climate
2. In some instances it will be necessary to conduct camera surveys of the seabed habitat before and after installation
3. Energy conversion – This to include peak power, mean power and energy converted whilst fully operational.

It is recognised that some tests will not be directly concerned with energy conversion and will not have a working power take off mechanism (e.g deployment trials, moorings tests etc). In such cases, energy conversion data will not be relevant.

Fees

The berthing fee payable to FHC will be charged per device per month or part thereof, in line with the scale of charges published annually by FHC.

HSE & Public / 3rd Party Safety

FHC supported by the Regulatory Body will ensure that a QHSE management plan for all permitted work at the FaBTest site is in line with the requirements of FHC - FaBTest Operating Policy FHC/FT/102. This will be achieved through an independent review of a developer's project plan (with regard to health & safety) to be commissioned by the PA and presented to the FaBTest Regulatory Body. The independent review will be performed by a suitably qualified and experienced contractor and will assess whether the PA is fully aware of its responsibilities and have adequately planned to fulfil them.

In addition to the requirements given above, It is a requirement of the FaBTest berthing permit that device developers will conduct a risk assessment study in respect of unauthorised public access to the MEC. Adequate measures must be provided to discourage access and inform on particular hazards. A copy of the risk assessment study, together with the control measures, will be submitted to the regulatory panel for review.

Guidance templates for completion of all QHSE documentation can be found at Appendix 8