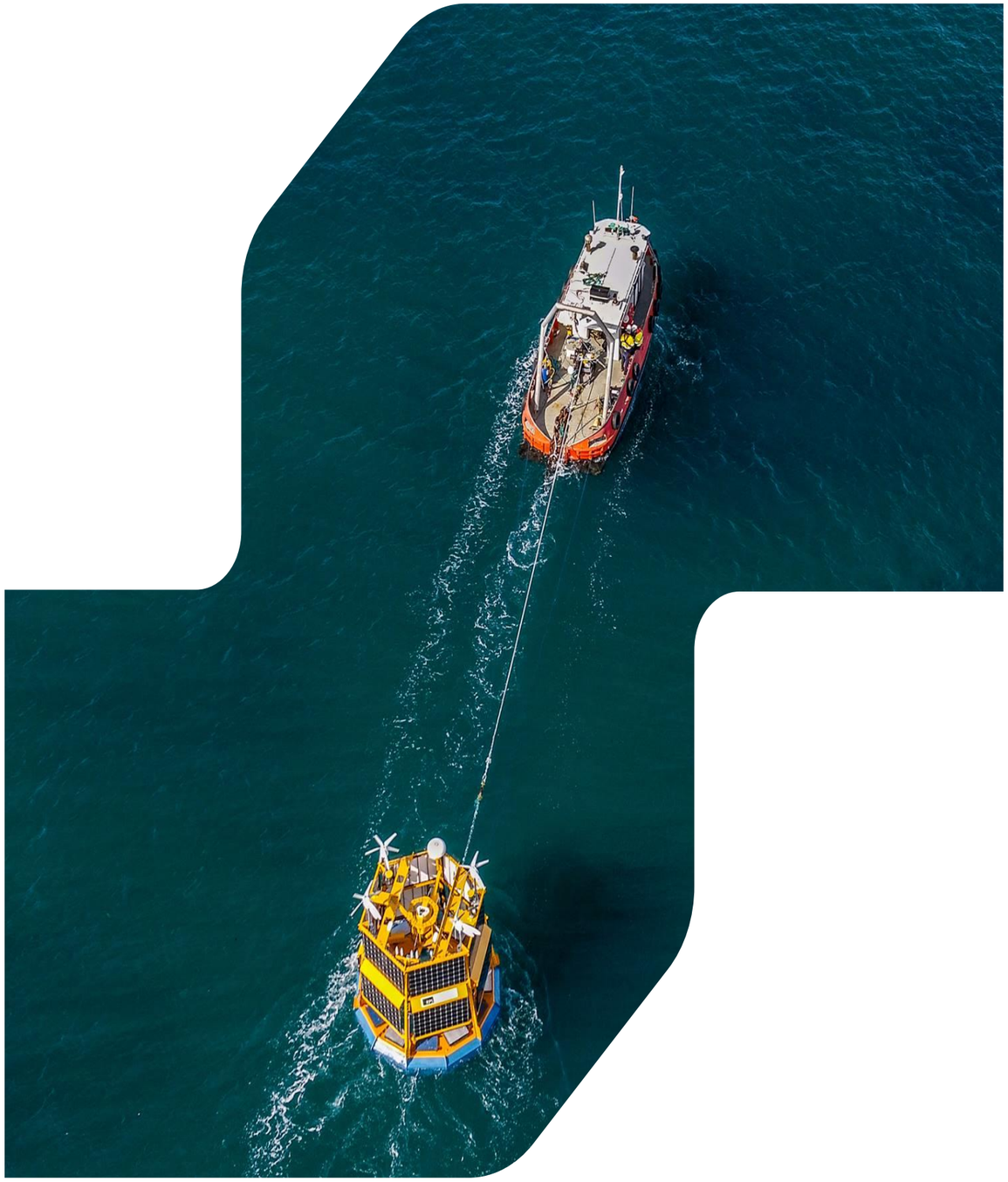
MARINE ENERGY WALES

MARINE ENERGY TEST AREA (META)

Environmental Impact Assessment

Non-Technical Summary



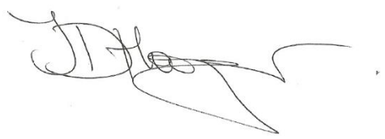
EOR0730
Marine Energy Test Area
Rev: 02
June 05, 2019

rpsgroup.com

Document Status

Version	Date	Authored by	Reviewed by	Approved by	Review date
Rev00	24/05/19	LB	RDS	RDS	27/05/19
Rev01	31/05/19	LB	RDS	RDS	31/05/19
Rev02	04/06/19	LB	RDS	RDS	04/06/19

Approval for issue

Jessica Hooper  2019-06-05

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Prepared for:

Marine Energy Wales

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1. INTRODUCTION

1.1.1.1 The Environmental Statement was prepared by RPS on behalf of Marine Energy Wales, a Pembrokeshire Coastal Forum Community Interest Company (the Applicant) led project to support licence/consent applications for the Marine Energy Test Area (META) project. The Environmental Statement accompanies the applications for a Marine Licence and a Marine Works Licence for all three sites (Warrior Way (site 6), Dale roads (site 7) and East Pickard Bay (site 8), and Town and County Planning Permission for Warrior Way (site 6). Additional consents likely to be required are a Decommissioning plan sign off, a Crown Estate Lease, and a Safety Zone Consent.

1.1.1.1 The META project forms part of Pembroke Dock Marine, a £76 million project to develop a world class centre for marine energy development, fabrication, testing and deployment, in Pembrokeshire. The META project aims to provide a suite of offshore marine energy test sites within, and in proximity to, the Milford Haven Waterway (subsequently referred to as 'the Waterway'), to facilitate the testing and development of marine energy projects, de-risking marine energy projects prior to larger scale or array deployments. The over-arching META project proposes eight sites, three of which require Environmental Impact Assessment for activities to be enabled. These three sites are located in the inshore waters of Pembrokeshire and include Warrior Way (site 6), Dale Roads (site 7) (both located within the Waterway) and East Pickard Bay (site 8) (located on the south-eastern boundary of the Waterway, 500 m west of Freshwater West bay).

1.1.1.2 Marine Energy Wales is a leading organisation in the Welsh marine energy industry with membership including worldwide technology developers, key stakeholders and supply chain companies. Pembrokeshire Coastal Forum is an award-winning Community Interest Company that works to protect the coast and marine environments in Pembrokeshire, for current and future generations. RPS is a registrant of the Institute of Environmental Management and Assessment Quality Mark. All chapters have been authored by RPS with the exception of chapter 15: Socioeconomic and Tourism which was authored by Hardisty Jones Associates and Appendix 12.1: Navigational Risk Assessment which was authored by Marico Marine.

[1] https://naturalresources.wales/permits-and-permissions/marine-licensing/?lang=en

1.1.1.3 Consultation has been undertaken throughout the development of the project and the Applicant has engaged with the local community in order to inform local people about the META project, to explain what the purpose the META project is and to outline what potential effects on the receiving environment may result from the project, and to take on board any concerns or issues raised. Five public exhibitions took place within Pembrokeshire and key concerns raised were demarcation of infrastructure; impact on shipping and navigation, particularly small crafts and boat users; restrictions and/or exclusion zones, with particular respect to fishing, recreational shipping, and sailing; visual and landscape impacts; coastal processes; decommissioning; and environmental impacts. These comments have been taken into account by the Applicant in the preparation of the consent/licence applications and, where relevant, in the Environmental Impact Assessment process presented within this Environmental Statement.

1.1.1.4 The META project requires an Environmental Impact Assessment in order to identify and collate information to inform the relevant consenting authorities and interested parties of the likely significant environmental effects of the META project. This is required by the Marine Works Environmental Impact Assessment Regulations 2007 (as amended 2017) and the Town and Country Planning Environmental Impact Assessment (Wales) Regulations 2017.

1.1.1.5 Topics covered in the Environmental Impact Assessment are, Coastal Processes; Underwater Noise; Benthic Subtidal and Intertidal Ecology; Fish and Shellfish Ecology, Marine Mammals, Basking Shark and Otter; Marine Ornithology; Commercial Fisheries; Shipping and Navigation; Marine Archaeology; Seascape; Socio-economic and Tourism; and Other Users.

1.1.1.6 The Environmental Statement has been submitted to Pembrokeshire County Council; Natural Resources Wales; and Milford Haven Port Authority (MHPA) as part of consent applications for the META project. The relevant documents, files and application forms are available online through the Natural Resource Wales Marine Licensing Consultation page[1] and will be available for public viewing at Pembroke Dock Library. A number of public exhibitions will also be held in the local area which will be advertised on the applicant website[2]. An electronic copy (pdf) is available from the MEW team, please email meta@marineenergywales.co.uk to request access. All comments on the Environmental Statement (and consent/licence applications) should be issued to the relevant regulatory authority. A copy of this non-technical summary is available in Welsh upon request.

2. PROJECT DESCRIPTION

2.1.1.1 Scaled and full-scale marine energy device testing will be enabled at the META project. Testing will not be grid-connected. Testing activities which will be supported at the META project are:

- Scale wave device testing;
- Scale tidal device testing;
- Full scale wave device testing;

[2] www.pembrokeshirecoastalforum.org.uk

- Micro tidal device testing;
- Testing of remotely operated vehicle (ROV) or other monitoring equipment;
- Site preparation methodologies;
- Installation and decommissioning methodologies;
- Salvage methodologies; and
- Tow, float and mooring solution testing for floating offshore wind technology.

2.1.1.2 Consent will be sought for the META project sites (Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) for a duration of up to 15 years. The maximum and most likely activity testing scenarios are provided below:

- Maximum Scenario: single activity testing at any one time at Warrior Way (site 6) and Dale Roads (site 7), and up to two testing activities at any one time at East Pickard Bay (site 8); and
- Most Likely Scenario: single activity testing at any one time at Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) i.e. three concurrent activities at three separate locations.

2.1.1.3 Warrior Way (site 6) does not have the capacity/area to support full-scale tidal devices other than micro full-scale devices, therefore full large-scale tidal device deployment will not be supported. Devices will be towed to site and installed on pre-prepared foundations, moorings, deployed on the seabed, or deployed from a floating platform or test support buoy. Dale Roads (site 7) and East Pickard Bay (site 8) will support wave energy devices and East Pickard Bay (site 8) may also support floating offshore wind component testing. Pin piling may be required for installation activities at both Dale Roads (site 7) and East Pickard Bay (site 8), and rock ballasting may be required at East Pickard Bay (site 8).

2.1.1.4 Test deployments at all sites will be demarked by up to four navigational marker buoys and consultation with Milford Haven Port Authority on navigational marking requirements will be undertaken on a device-specific basis. Operational testing at all three sites may be throughout the year (will not be seasonally restricted) and will not be restricted to daylight hours, however deployment and retrieval, and maintenance activities will be restricted to daylight hours, wherever possible.

2.1.1.5 To accompany the environmental statement, Marine Energy Wales will provide outline operational plans in order to facilitate environmental management for the duration for the META project. These include an Environmental Management Plan; an Environmental Mitigation and Monitoring Plan; a Marine Pollution Contingency Plan; and an Invasive Non-Native Species Management Plan. Pembrokeshire Coastal Forum will ensure a high standard of Quality, Health, Safety and Environmental Management throughout the duration of the META project. Best practice mitigation and management measures have also been identified and will be followed to reduce the potential impact of activities associated with META.

2.1.1.6 All developers utilising the META sites will be required to be fully compliant with their responsibilities as defined by the Health & Safety at Work Act (1974); the Marine and Coastal Access Act (2009); Construction (Design and Management) Regulations 2015; and all other appropriate legislation in force at the time of their deployment. Developers, to support device testing at the META project sites, will also be expected to provide rigorous documentation, including project design, execution, decommissioning and engineering assessment documentation; health, safety and environmental management documentation, and emergency response procedures and risk assessment and method statements.

3. NEED AND ALTERNATIVES

3.1.1.1 In determining a Marine Licence application, significant weight should be attached to considerations of the need for energy generating capacity in line with policy context and the potential of the META project to contribute to meeting that need.

3.1.1.2 The UK and Welsh Government has made clear the urgent need for new energy generating capacity, with an expectation that this new capacity will move towards the generation of electricity from wave and tidal power.

3.1.1.3 The UK Marine Policy Statement sets out the vision of a '*clean, healthy, safe, productive and biologically diverse oceans and seas*'; to '*Enable the UK's move towards a low-carbon economy, to mitigate the causes of climate change and ocean acidification*'; and to '*Promote sustainable economic development*.' Consideration of the UK Marine Policy Statement has been considered in the META project.

3.1.1.4 National policy has also been considered in the form of the draft Welsh National Marine Plan, the Well-being and Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016. Key drivers and objectives of national policy include consideration of the Welsh economy; consideration of the management of the natural environment and resources; and the sustainable development of marine renewable energy resources. Local policy context, including the Wales Spatial Plan and the Pembrokeshire Local Development Plan have also been considered.

3.1.1.5 Whilst there are a number of existing marine energy testing facilities within the UK, many marine energy technology developers are still at the testing and demonstration phase, therefore, a need for appropriately targeted, innovative, local facilities in Welsh waters has been identified. The provision of testing sites at the META project, in relatively benign at-sea environments, will work towards de-risking technology and operations critical to the success of further larger scale or array deployments, as well as improving understanding of potential environmental impacts of marine energy deployments.

3.1.1.6 Alternative sites for the META project were considered, taking into account the parameters and requirements of the proposed META project. In order to comply with the aims of the over-arching Pembrokeshire Dock Marine project and the META project, site selection was limited to within Pembrokeshire waters, with a focus on an existing energy cluster that has grown around the Pembroke Dock area. One of the key drivers of site selection was wave and tidal resource, requiring a suite of sites to be identified in both benign as well as higher-energy at-sea environments. In addition, sites were considered in relation to potential interface with shipping and navigation, other users and environmental designated sites and interests. Selection of the suite of META sites has followed a rigorous site selection process that has incorporated resource assessment, a desktop review of available data, constraints analysis, and developer and stakeholder discussions. Site selection has been iterative, and has followed a staged, chronological assessment.

3.1.1.7 The main reasons alternative sites were eliminated were; site outside jurisdiction of MHPA; risk to other users; risk to recreational areas; requirement to schedule activities around other users; and challenging site due to depth, ground conditions and presence of designated sites and associated notified interest features.

3.1.1.8 Once the sites had been refined, indicative site areas were illustrated in a preliminary site figure to facilitate further developer engagement for refinement of the sites' suitability to meet developers' needs. The indicative areas were also sent to The Crown Estate to enable interrogation of their internal data regarding other users of the areas in question. A technology developers' questionnaire was authored and issued, with the intention of defining a more robust baseline of activities that the META project was likely to be used for, and identifying the key infrastructure, equipment and consents that technology developers would require to support their testing.

3.1.1.9 The three sites which aligned with all requirements were Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8). Final refinements to Warrior Way (site 6) and East Pickard Bay (site 8) was undertaken following feedback from consenting authorities in order to avoid potential impact on designated reef habitat.

4. ENVIRONMENTAL ASSESSMENT METHODOLOGY

4.1.1.1 The Environmental Statement summarises the Environmental Impact Assessment that has been undertaken to assess the potential impacts of the project on the receiving environment. The Environmental Assessment methodology has followed the process set-out below.

4.1.1.2 Scoping is the process of identifying the issues to be addressed during the Environmental Impact Assessment process. Though not a statutory requirement, scoping is a very useful preliminary procedure, which sets the context for the Environmental Impact Assessment process. A Scoping Report and request for a Scoping Opinion was submitted to the following regulatory authorities:

- Natural Resources Wales Marine Licencing Team;
- Marine Management Organisation;
- Milford Haven Port Authority;
- Pembrokeshire County Council; and
- Pembrokeshire Coast National Park Authority (PCNPA).

4.1.1.3 A Scoping Opinion was returned by Natural Resources Wales (with input from other regulatory authorities and stakeholders) and highlighted a number of areas that consultees wished to see addressed within the Environmental Statement. Meetings have been undertaken throughout the Environmental Impact Assessment and design process in order to agree methodologies and request and share information regarding existing environmental conditions. In addition, consultation has been undertaken to develop links with relevant regulatory authorities, fisheries interests, Ministry of Defence (MOD), navigational interests, public interest groups and device developers.

4.1.1.4 The assessment has also taken into account the following key areas:

- Climate change resilience;
- Changes to future environmental conditions; and
- Effects of the project on climate.

4.1.1.5 The EIA process has considered relevant government or institute guidance as well as other topic specific legislation and good practice guidance, including the National Planning Policy Framework.

4.1.1.6 The assessment of each environmental topic forms a separate chapter of the Environmental Statement and addresses the study area; description of the environmental baseline conditions; limitations and key parameters of the assessment; mitigation measures, design measures and proposed monitoring adopted for the project; impact assessment methodology; identification of likely effects and the significance of each effect; identification of any cumulative impacts, as well as assessment of transboundary (impact on other European Union states) and inter-related effects (with other topics considered in the assessment).

4.1.1.7 Each chapter identifies and assesses a group of receptors. Receptors are defined as the physical or biological resource or user group that would be affected by a project.

4.1.1.8 The assessment of effects for each topic assesses the magnitude of the impact, the sensitivity of the receptor and the overall significance of effect. The categorisation of the magnitude of impact is topic-specific but generally considers factors such as extent, duration, whether the impact is continuous or intermittent, timing and frequency, and reversibility. Impacts are either defined as adverse or beneficial, and depending on discipline, they may also be defined as direct or indirect. The magnitude of an impact has generally been defined using the scale of major, moderate, minor, negligible or no change.

4.1.1.9 The sensitivity or value of a receptor may depend on its frequency, extent of occurrence or conservation status. Assessment of sensitivity for each receptor group is presented and takes into account factors including vulnerability, recoverability and value or importance, and is generally described using the scale of Very High, High, Medium, Low and Negligible.

4.1.1.10 Significance of effect is the term used to express the consequence of an impact and considers the magnitude of the impact and the sensitivity of the receptor. The assessment of significance is based on the scale of Substantial, Major, Moderate, Minor and Negligible.

4.1.1.11 Where required, further mitigation measures have been identified within topic chapters. These are measures that could further prevent, reduce and, where possible, offset any adverse effects on the environment.

4.1.1.12 For the purposes of this Environmental Statement, the cumulative impact assessment in each chapter will assess the META project alongside the potential effect of other plans or projects, on identified receptor groups.

4.1.1.13 Each technical chapter considers whether there is the potential for any transboundary impacts on other European Union states.

4.1.1.14 Each topic chapter considers whether or not there are any inter-related effects with other topics included within the Environmental Impact Assessment that have not already been considered in order to identify any secondary, cumulative or synergistic effects.

5. COASTAL PROCESSES

5.1.1.1 The Warrior Way (site 6) and Dale Roads (site 7) sites are both located within the Waterway which is a deep-water macro-tidal ria believed to be created by the flooding of the Daugleddau river valley (which itself was formed by the merging of the tributaries of the Eastern and Western Cleddau), during the sea level rise at the end of the last Ice Age. It is the largest flooded valley in Europe and is also a historical deep-water anchorage. The Waterway has the capacity to be a large sediment sink, based on its morphology, however there is limited sediment input from offshore areas and the rivers flowing into the Waterway are not thought to contribute large volumes of sediment. Within the catchment are the two main rivers of the Western and Eastern Cleddau, which merge to form the Daugleddau before entering the Waterway. Pembroke River also flows into to the Waterway just west of Pembroke Dock.

5.1.1.2 Warrior Way (site 6) is situated east of the Cleddau bridge. The tidal range propagates from the mouth of the Waterway up into the estuary, with high tide moving in a west to easterly direction. This stretch of the estuary supports the greatest tidal resource in the Milford Haven Estuary. Currents are predominately flowing in an east to westerly direction.

5.1.1.3 At Dale Roads (site 7) high tide occurs from the west and moves eastward into the estuary. Currents are predominately determined by the tide flowing in and out of the Waterway with sediment accumulation on the periphery of the bay at the Dale Roads site (site 7) with mud flat backed by sandstone. The site is characterised by medium sand over silt/clay. The material is very poorly sorted with material being finer at the north west corner of the site. Dale Roads (site 7) supports depths of between 8 and 12 metres and benefits from a significant wind and wave fetch from the south and southwest.

5.1.1.4 East Pickard Bay (site 8) is located 0.5 km from the shoreline to the north east, which consists of rock cliffs with rocky outcrops. The eastern extent of the site is 0.75 km from the north west edge of Freshwater West Bay which comprises a sandy beach 0.5 km wide at low water and is backed by dunes. Tidal range within East Pickard Bay (site 8) remains fairly consistent with minimal variation throughout seasonal cycles. The predominate current runs from an east to west direction through the site, and a strong rip tide can be found at the south of Freshwater West Bay. East Pickard Bay (site 8) is exposed to a good wave resource benefiting from a 200 km fetch from the prevailing wind direction and has a water depth of between 10 and 29 m.

5.1.1.5 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on coastal processes receptors have been assessed, namely, *increases in suspended sediment concentration and deposition of disturbed sediment to the seabed; release of contamination adsorbed to sediments disturbed, on ecological receptors; changes to the wave regime, with associated impacts on adjacent coastlines;* and *changes in hydrodynamics associated with tidal devices.*

5.1.1.6 The impact assessment considered the potential for activities during the installation, operational and decommissioning phases to lead to potential changes in coastal processes. Increases in suspended sediment concentration and deposition of disturbed sediment on the seabed could occur in all phases of the proposed development though magnitude is expected to be minor. These have the potential to affect sensitive ecological receptors (benthic ecology and fish and shellfish ecology) and therefore the significance of the effects have been assessed in the relevant ecological receptor assessments (chapter 7 and 8 respectively). Similarly, release of contamination adsorbed to disturbed sediments during installation could lead to physiological or ecological effects on marine biota in the study area. The magnitude of impact is assessed as negligible to minor. The significance of the effect has been assessed in relevant chapters 7 and 8. No mitigation or monitoring has been proposed for these three potential impacts.

5.1.1.7 Changes to wave regime with associated impacts on adjacent coastlines could arise as a result of abstraction of wave energy from wave devices. Warrior Way (Site 6) was therefore scoped out as this site is only proposed to support the testing of scaled tidal devices. The assessment concluded that the effects would be of minor adverse significance and no mitigation or monitoring was considered necessary.

5.1.1.8 Changes to the hydrodynamic regime due to operation of the tidal turbines (Warrior Way (site 6) only) could arise from changes to near field flows downstream of rotors. The assessment concluded that there was unlikely to be any changes in the flow regime and indiscernible changes in currents speeds outside the immediate sweep area (0.35 % of the cross-sectional area of the channel at Warrior Way (site 6) at the mean water level), and the effect would be of minor adverse significance. No mitigation or monitoring was considered necessary in respect of this impact.

5.1.1.9 Interaction between the metocean regime (wave, sand and currents) and wave energy devices has the potential to cause localised scouring of seabed sediments around marine energy structures. Scour due to scaled tidal device operation has been scoped out due to the limited nature and duration of the installation and testing at Warrior Way (site 6). The assessment concluded that the effects at Dale Roads (site 7) and East Pickard Bay (site 8) would be of minor (adverse) significance. The magnitude of the potential scour is both site and device specific; particularly where the structure occupies part of the water column. Device-specific mitigation measures such as micro-siting and design may be required should the device-specific assessment raise concern in relation to potential impacts of scour.

5.1.1.10 Foundations used for marine energy devices may alter sediment transport, interrupting sediment transport pathways during the operation phase. The scale of this potential impact will depend on whether a pathway exists in the site of deployment and on the proportion of the pathway obstructed. The significance of the effect was assessed as being minor (adverse) at all sites and no mitigation or monitoring was proposed.

5.1.1.11 There is the potential for cumulative increases in suspended sediment concentration and sediment deposition within the coastal processes study area as a result of installation and decommissioning activities associated with the META project together with activities associated with the Pembroke Dock Marine project, dredging and disposal activities in the Waterway, installation of a temporary marine cable and wave energy device associated with the proposed Bombora project, and the Greenlink Interconnector project. Cumulative impacts are predicted to be unlikely and if they occur of a temporary and short-term nature and therefore not significant (in EIA terms).

5.1.1.12 Transboundary effects were considered for each chapter; there was not considered to be any potential transboundary effects for any of the assessed topics, and will therefore not be discussed any further in this document.

5.1.1.13 Inter-related effects were also considered; there was not considered to be any potential coastal processes inter-related effects.

6. UNDERWATER NOISE

6.1.1.1 The underwater noise chapter presents the results of a desktop study addressing the potential impacts that may arise due to underwater noise from the proposed META project. It is considered that the key issues will be the effects of underwater noise on marine mammals and fish from device installation noise and operation of devices. The study concluded that:

- Baseline noise levels will be highest during periods when the marine energy test devices are likely to be at their maximum noise output (due to elevated wave and tidal noise);
- There is potential for vessels and drilled pin piling to cause noise during the installation and decommissioning phase;
- There is potential for some installation activities to cause injury to marine mammals within an 88 m radius of the installation vessel, but this assumes that the marine mammal will stay within this radius for a 24-hour period, which is a highly unlikely scenario;
- Potential disturbance to marine mammals could occur within 12 km of the installation activities, although in reality it is likely that baseline ambient noise will mask this thus reducing the likelihood of disturbance occurring;
- There is a low risk of injury to fish during the installation phase – even the most sensitive fish would need to stay within a distance of less than 6 m from vessels for a 48-hour period to experience injury. This is considered highly unlikely;
- Disturbance to fish is only likely with 37 m or less from installation vessels;
- Injury could occur to marine mammals within 76 m of an operational marine energy device, although this assumes that the animal will stay within this range for a 24-hour period, which is considered highly unlikely;
- Disturbance to marine mammals could occur within 7 km of a marine energy device based on the highest noise output device modelled, although this would only be during periods of very high wave power – consequently ambient noise levels would also be elevated, and it is likely that noise from the devices would be masked;
- Although it is theoretically possible that fish could be injured within 4 m of an operational marine energy device if they stay within this radius for a period of 48 hours, this is considered a highly unlikely scenario; and
- Disturbance to fish could occur at up to 78 m of the highest noise output marine energy device, although this would only occur under very high wave heights.

6.1.1.2 The significance of the above effects is assessed within chapter 8: Fish and shellfish ecology and chapter 9: Marine mammals, basking shark and otter.

6.1.1.3 Based on the results of the underwater noise assessment, it is concluded that it is highly unlikely that injury will occur for any marine mammal or fish species as a result of the META project.

7. BENTHIC SUBTIDAL AND INTERTIDAL ECOLOGY

7.1.1.1 A number of benthic habitat and species receptors were identified as having the potential to occur in the META project area, including intertidal and subtidal receptors. Intertidal receptors include Annex I habitat '*Mudflats and sandflats not covered by seawater at low tide'*; Annex I intertidal '*Reefs'* habitat; intertidal seagrass (*Zostera noltii*); and Annex I habitat '*Atlantic salt-meadow (Glauco-Puccinellietalia maritimae*)' (including *Salicornia* spp.). Subtidal receptors include Annex I subtidal '*Reef'* habitat (e.g. estuarine rocky habitats, subtidal mixed muddy sediments and tide swept channels); Annex I '*Estuaries'* (e.g. intertidal mudflats; maerl; and seagrass beds); Annex I 'Large shallow inlets' (e.g. fragile sponge and anthozoan communities on subtidal rocky habitats; and intertidal underboulder communities); subtidal seagrass (*Zostera* marine); maerl beds (*Phymatolithon calcareum*); Annex I '*Sandbanks which are slightly covered by sea water all the time*' habitat (gravelly and clean sands; and muddy sands); coarse sediment; and submerged or partially submerged sea caves.

7.1.1.2 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on benthic subtidal and intertidal ecology have been assessed: *temporary habitat disturbance; temporary increases in suspended sediment concentration and associated sediment deposition; resuspension of contaminated sediments; introduction of INNS; accidental pollution; habitat loss; alteration of seabed habitats;* and *alteration of benthic habitats.*

7.1.1.3 The impact assessment considered the potential for habitat disturbance or loss during all phases of the META project. Seabed clearance activities prior to the installation of the devices and moorings, along with installation of mooring or anchor spreads for vessels, have the potential to result in the temporary disturbance of benthic habitats. Disturbance of benthic habitats during installation and decommissioning activities is likely to constitute abrasion/disturbance of the seabed surface. Any small mobile or non-mobile non-burrowing aquatic species likely to be found on the surface of the seabed (epifaunal) may potentially be damaged or destroyed. Benthic subtidal habitat loss during device/component operation is likely directly under all foundation structures and within the footprints of the devices/components themselves. Benthic subtidal receptors with the potential to be affected by temporary habitat disturbance during installation or decommissioning activities or habitat loss during device/component operation at the META sites are Annex I 'estuaries' and Annex I 'large shallow inlets' at Warrior Way (site 6) and Dale Roads (site 7) and circalittoral coarse sediment habitats at East Pickard Bay (site 8). If Annex I reef is recorded pre-deployment, measures have been adopted as part of the project design (i.e. identifying specific sites for testing infrastructure) to ensure that direct impacts to Annex I receptors are avoided. The significance of the effect was assessed as negligible to minor (adverse).

7.1.1.4 The impact assessment considered the potential for increase in suspended sediment concentration and associated sediment deposition during installation and decommissioning phases. Sediment disturbance may arise from a range of installation and decommissioning activities, such as gravity base installation and drilling to install pin piles. The greatest level of disturbance is expected from the installation of gravity bases or bed mounted devices. Increased suspended sediment concentration can affect filter feeding organisms through clogging and damaging feeding and breathing. Disturbance of sediments will also cause some sediment deposition potentially resulting in the smothering of benthic species and habitats. The benthic subtidal receptors with the potential to be affected by temporary increases in suspended sediment concentration and sediment deposition during installation activities are: Annex I 'estuaries' and Annex I 'large shallow inlets' at Warrior Way (site 6) and Dale Roads (site 7), Annex I subtidal 'reef' at all three META sites and circalittoral coarse sediment habitats at East Pickard Bay (site 8). The benthic intertidal receptors with the potential to be affected by temporary increases in suspended sediment concentration and sediment deposition during installation activities are: Annex I habitat 'Mudflats and sandflats not covered by seawater at low tide' and Annex I intertidal 'Reefs'. It is expected that fine sediment particles will be removed by wave or tidal action moderating the impact of this pressure, and most bivalves which live beneath the surface of the seabed (infaunal) and marine worm (polychaete) species are capable of burrowing through sediment to feed. The significance of the effect was assessed as minor (adverse).

7.1.1.5 The impact assessment considered the potential for resuspension of contaminated sediments during installation and decommissioning phases. Activities which have the potential to result in increased suspended sediment concentration and sediment deposition also have the potential to result in a release of contaminated sediments which may cause detrimental effects on benthic subtidal and intertidal receptors. Sediments within the Waterway have been exposed to historic levels of contamination, associated with the industries in the Waterway. It is likely, based on the available desktop information, that levels of contaminants are, on the whole, below Sediment Quality Guidelines and levels which would result in adverse effects to benthic receptors. Responses and tolerance to heavy metal and hydrocarbon contamination of characteristic species include high tolerance, accumulation of heavy metals, increases in energy expenditure and decreases in feeding rate, morphological changes, reduction in growth rate, and reduction of diversity in assemblages. Given the historic levels of anthropogenic impact and input to the Waterway, the benthic communities associated with relevant receptors are expected to be tolerant to the existing levels of contaminants within the sediments at the META sites. The significance of the effect was assessed as negligible.

7.1.1.6 Potential for alteration of seabed habitats during the operational and maintenance phase, arising from changes in physical processes through the presence of marine energy devices, and ancillary infrastructure was assessed. Interaction between the metocean regime and marine energy devices has the potential to cause localised scouring of seabed sediments leaving a depression around the structures, and associated foundations may interrupt sediment transport pathways, both of which have potential to affect benthic receptors. The benthic receptors likely to be affected by any changes in physical processes will be those within the META sites i.e. Annex I 'estuaries' and Annex I 'large shallow inlets' at Warrior Way (site 6) and Dale Roads (site 7) and coarse sediment habitats at East Pickard Bay (site 8). Benthic infaunal and epifaunal species are not considered sensitive to local changes in water flow. The significance of the effect was assessed as negligible.

7.1.1.7 Potential for alteration of seabed habitats during the operational and maintenance phase, arising from changes to the hydrodynamic regime at Warrior Way (site 6) was assessed. Tidal current devices which employ impeller or turbine technology remove energy from the tidal flow and therefore have the potential to alter the hydrodynamic regime. The benthic receptors likely to be affected are those present within Warrior Way (site 6) i.e. Annex I 'estuaries' and Annex I 'large shallow inlets'. Benthic infaunal and epifaunal species are not considered sensitive to local changes in water flow. The significance of the effect was assessed as negligible.

7.1.1.8 The potential risk of introducing Invasive Non-native Species to the META project area during all phases of the META project was assessed. There is a risk of the introduction and spread of marine Invasive Non-native Species through increased vessel movements and physical presence of infrastructure. Vessels can act as a vector for Invasive Non-native Species by allowing species from other geographical areas to be introduced to the project area. This in turn can affect the ecological balance of local benthic communities. Infrastructure placed in the water column has the potential to act as ecological 'stepping stones', allowing the spread of larvae. However, few Invasive Non-native Species may be able to colonise mobile sediments due to the high-levels of existing sediment disturbance. Of particular concern is the slipper limpet (*Crepidula fornicata*), however this is already well established in the Waterway and therefore doesn't constitute a new potential invasive non-native species. In addition, An Invasive Species Management Plan will be produced and agreed in consultation with statutory consultees. The significance of the effect was assessed as negligible to minor (adverse).

7.1.1.9 The potential for an accidental pollution event during all phases of the META project was assessed. The likelihood of a spill occurring is deemed to be extremely rare based on management measures in place through various legislation, and specifically to this project in the Marine Pollution Contingency Plan, therefore the significance of the effect for all receptors is assessed as negligible.

7.1.1.10 The cumulative impacts assessed are habitat loss/disturbance and increases in suspended sediment concentration and sediment deposition. There is the potential for cumulative temporary habitat loss and/or disturbance as a result of installation and operational activities associated with the META project together with activities associated with the following projects/activities: META Phase 1, Bombora Wave Energy offshore works, the Pembroke Dock redevelopment project, Wave Hub, dredging and disposal activities in the Waterway, the Greenlink Interconnector project (and associated surveys), and research undertaken by Swansea University. The significance of the effect is assessed as negligible to minor (adverse) significance. Temporary effects to benthic receptors from elevated suspended sediment concentration and sediment deposition may occur as a result of cumulative impacts arising from projects that spatially or temporally overlap with the META project. The significance of the effect is assessed as negligible to minor (adverse).

7.1.1.11 Likely inter-related effects considered include project lifetime effects (associated with temporary habitat loss/disturbance) and receptor-led effects (interaction of temporary habitat loss/disturbance during installation/decommissioning and operation from anchor spreads, and the presence of the devices/components on the seabed and indirect habitat disturbance due to sediment deposition arising from the installation of gravity bases and pin piles). The project lifetime of META is estimated at up to 15 years and therefore there is the potential for repeat habitat disturbance within the boundaries of the META sites for the duration of the project. However, the temporary habitat loss/disturbance will be highly localised to the vicinity of the activity and intermittent, and all benthic habitats are predicted to recover within a maximum of five years. Therefore, across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase. For receptor-led effects, it is predicted that potential combined impacts will not be any more significant than the individual impacts in isolation.

7.1.1.12 A device-specific pre-deployment benthic survey may be undertaken to facilitate the identification of specific sites for infrastructure in order to avoid placing infrastructure at Annex I reef.

8. FISH AND SHELLFISH

8.1.1.1 Fish and shellfish ecology refer to the communities of animals which live within the marine environment and the relationships that they have with each other and with the physical environment. The fish and shellfish ecology of the META project site was characterised using site-specific surveys (using grab sampling, underwater video and fish trawls), available published data and a thorough literature review.

8.1.1.2 Fish species were found to be predominately bottom-dwelling species, including flatfish and sharks, with migratory fish species, such as Atlantic salmon, lamprey and shad transiting the Waterway. Shellfish species primarily consisted of the native oyster, mussel beds, edible crab and lobsters. In addition, surveys determined the presence of spotted catsharks, flatfish and spider crabs within East Pickard Bay (site 8) and near Dale Roads (site 7).

8.1.1.3 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on fish and shellfish receptors have been assessed: *temporary changes to fish and shellfish habitat, temporary increases in suspended sediments, accidental pollution, colonisation of hard structures, medium term habitat loss, tidal turbine collision risk at Warrior Way (site 6) and physical barrier to movement of known migratory routes due to presence of tidal turbines at Warrior Way (site 6).*

8.1.1.4 Installation activities and the presence of devices and ancillary equipment have the potential to result in temporary or medium-term changes to habitat for fish and shellfish, including reduction in water-column availability or temporary disturbance to or loss of seabed habitat or compaction of sediment. These changes may result in a temporary reduction in fish and shellfish species abundance or diversity within affected areas, though demersal fish and shellfish species and demersal spawning species are likely to be affected to the greatest extent. Habitat disturbance also has the potential to result in the creation of new temporary habitats or feeding opportunities for fish and shellfish receptors. Any mounding of sediments due to placement of structures is expected to disperse in the relatively energetic marine areas and will re-join the naturally occurring sedimentary processes at the META project sites. In addition, the expected footprint for potential habitat disturbance represents a very small proportion of available fish and shellfish habitat within the proposed META project areas and is expected to be of short to medium-term duration and intermittent. The significance of the effect is therefore considered to be minor (adverse/beneficial), which is not significant in EIA terms.

8.1.1.5 Temporary increases in suspended sediments may affect species which are attached to the seabed (e.g. mussels, oysters) and filter-feeders, potentially damaging feeding and breathing organs. Juvenile fish and shellfish and eggs, may be more susceptible, resulting in increased fatalities, than adult fish and shellfish, as adult species are more able to move away from the source. Anchoring/attachment of marine energy devices and navigational marker buoys, as well as vessel movements, may lead to temporary disturbance of sediment within the test deployment areas. It can be expected that any suspended sediments will quickly dissipate and disperse according to the sites' hydrological regimes (chapter 5: Coastal Processes). In addition, all activities proposed at all three test areas are of a temporary and intermittent nature; seabed disturbance and associated temporary increases in suspended sediments is therefore considered to be occasional and of very short duration. The significance of the effect is therefore considered to be minor (adverse), which is not significant in EIA terms.

8.1.1.6 The potential impact of accidental pollution was considered on the basis of a maximum adverse scenario of the release of a large inventory of fuel oil from a vessel. Fish species may be vulnerable to pollutants in the very short-term when the accidental event occurs, however recovery is likely to be high as all META sites are located in environments where any pollutants would disperse rapidly. Static receptors and less mobile species unable to avoid accidental pollution events are the most likely to be adversely impacted. The significance of the effect on all receptors was considered however to be negligible, on the basis that the likelihood of an accidental pollution event occurring is considered highly unlikely and will be managed by a Marine Pollution Contingency Plan.

8.1.1.7 The introduction of a marine renewable device and its associated ancillary infrastructure presents a novel surface for colonisation by fish and shellfish. Whilst devices are likely to have an EU compliant marine biofoulant preventing colonisation, fish could potentially lay eggs on ancillary structures, with shellfish actively recruiting and colonising structures. The potential impact of colonisation of hard structures is predicted to be of local spatial extent and short-term duration. The impact is therefore considered to be reversible and the significance of the effect is deemed to negligible.

8.1.1.8 Introduction of a single tidal turbine at any one time at Warrior Way (site 6) poses a potential risk of collision and/or a physical barrier to movement of known migratory routes for fish. It is assumed that shellfish will not be impacted, based on their benthic ecology. Device components, specifically the terminal end of the rotating blade, poses the greatest risk of potential injury in the event of a collision. The physical presence of the device has the potential to prevent migratory species from reaching breeding / feeding grounds, and therefore may affect breeding success. The likelihood of collision, based on the expected size of the scaled or micro-scale tidal turbine, is expected to be extremely low and the significance of the effect is therefore considered to be negligible. Based on the size and short-term duration of a tidal turbine deployment, in combination with likely avoidance behaviour of fish it is considered unlikely that tidal turbine deployment will pose as a barrier to movement of sensitive species such as allis and twaite shad. The significance of the effect is therefore considered to be minor (adverse), which is not significant in EIA terms.

A.1.1.1 Cumulative impacts from dredging sites, research, infrastructure, the proposed Bombora wave energy project and other Pembroke Dock Marine projects were assessed and predicted to result in effects of negligible to minor (adverse) significance (not significant in EIA terms).

8.1.1.9 Increases in suspended sediment concentration may result in a decrease in visibility and the effectiveness of a fish to see a marine tidal device. This increase in suspended sediment concentration may result in an increased collision risk for fishing passing nearby or through the marine tidal device. However, the impact assessment carried out for fish and shellfish deemed no significant effects. It is therefore considered unlikely that there are inter-related effects on fish and shellfish populations as a result of the META project.

8.1.1.10 There is considered to be no potential for significant impacts on fish and shellfish ecology receptors as a result of the META project, and therefore no mitigation or monitoring is considered necessary.

9. MARINE MAMMALS, BASKING SHARK AND OTTER

9.1.1.1 To determine baseline conditions of the receiving marine environment a thorough desktop review was undertaken. According to sightings data, harbour porpoise, bottlenose dolphin, short-beaked common dolphin, Risso's dolphin, minke whale, grey seal, basking shark and European otter are expected to occur in low densities and intermittently in the waters surrounding the META project area. Grey seals are considered most likely to occur it the Waterway.

9.1.1.2 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on marine mammals, basking and otter receptors have been assessed: *increased anthropogenic underwater noise and increased collision risk due to uplift in vessel numbers*, *increased anthropogenic underwater noise and collision risk due to presence of tidal turbine at Warrior Way (site 6); increases in suspended sediment concentration (SS); changes in fish and shellfish communities; accidental pollution*; *changes in hydrodynamic regime;* and *entanglement risk.* Assessment deemed all impacts to be of negligible or minor (adverse) significance.

9.1.1.3 Some uplift in anthropogenic noise and potential for collision risk as a result of increased vessel numbers related to the META project is expected. An underwater noise assessment was carried out to determine potential for disturbance and injury to marine mammals. A precautionary approach to the assessment was taken assuming that individuals of all species of marine mammals, basking shark and otter have the potential to enter the Waterway, however considering the potential zone of impact is very small, and the local/regional density estimates for all marine mammals, basking shark and otter are low, few animals are expected to enter the zones of impact for auditory injury, disturbance or collision risk. Duration of individual vessel movements is predicted to be short-duration (intermittent) but long-term when considered over the period (15 years) of the META project. The significance of the effect is considered to be negligible – minor (adverse), which is not significant in EIA terms.

9.1.1.4 The potential for anthropogenic noise impacts and collision risk as a result of potential operation of tidal turbines at Warrior Way (site 6) has been considered. An underwater noise assessment was carried out based on noise measurements of an OpenHydro tidal turbine at the EMEC facility in Orkney (Parvin and Brooker 2008). On the basis of very low radius of disturbance (0.5 km) or injury (maximum of 3 m) from noise and taking into account the very low likelihood of marine mammals or basking shark travelling far enough down the Waterway to enter the zone of impact for injury or disturbance for noise or collision risk is highly unlikely. Although otters utilise the coastline of the local marine mammal, basking shark and otter study area, and can be expected to be in the vicinity of Warrior Way (site 6), based on lack of receptor-pathway for noise disturbance or injury it is expected that no animals will be negatively affected by this impact. Otters usually forage less than 50 m form shore and less than 8 m water depth, and the tidal turbine would most likely be deployed beyond this range. It is also highly likely that marine mammals, basking sharks and otters would exhibit avoidance, and therefore the significance of the effect for noise and collision risk is considered to be negligible – minor (adverse), which is not significant in EIA terms.

9.1.1.5 The potential impact of increases in suspended sediment concentration as a result of installation of marine energy devices and associated infrastructure was considered. This has the potential to affect receptors through visual impairment and residual effects on navigation and feeding. Chapter 5: Coastal processes, reported that any disturbance would be expected to settle in a relatively short period of time and increases in suspended sediment concentration are expected to be to be occasional and of very short-duration for individual deployments. The significance of the effect for all receptors is considered to minor (adverse), which is not significant in EIA terms.

9.1.1.6 The potential impact of changes to fish and shellfish communities as a result of habitat loss/disturbance and increases in suspended sediment concentration was considered. Fish species identified as important components of the fish community and prey for marine mammals, basking shark and otter in the META project area include clupeids (e.g. herring), gadoids (e.g. cod, whiting), flatfish, and sandeels. Chapter 8: Fish and Shellfish assessed the impacts on fish and shellfish communities as minor (adverse). Due to the highly mobile nature of marine mammals, basking shark and otter it is likely that animals will be able to exploit similar resources elsewhere. There could however, be some energetic cost if animals have to travel further to alternative foraging grounds. The significance of the effect for all receptors is considered to minor (adverse), which is not significant in EIA terms.

9.1.1.7 The potential impact of accidental pollution was considered, on the basis of maximum adverse scenario of the release of a large inventory of fuel oil from a vessel. Although marine mammal, basking shark and otters are all highly mobile, specific concerns related to this impact include ingestion of contaminated prey, potential irritation of skin and eyes, inhalation of toxic fumes and abandonment of polluted feeding habitat. The significance of the effect on all receptors was considered however to be negligible, on the basis that the likelihood of an accidental pollution event occurring is considered highly unlikely, and will be managed by a Marine Pollution Contingency Plan (MPCP).

9.1.1.8 The potential impact of changes in hydrodynamic regime as a result of tidal current devices at Warrior Way (site 6) was assessed. Based on sightings data, it was predicted that only harbour porpoise, grey seal and otter had the potential to enter the vicinity of Warrior Way (site 6). Chapter 5: Coastal processes assessed this impact as being minor (adverse). It is also highly likely that animals would exhibit avoidance, and in addition, numbers of animals likely to be in the area are extremely low. The significance of the effect on all receptors is considered to be minor (adverse).

9.1.1.9 The potential impact of entanglement due to mooring of devices was assessed. A number of factors including the visibility, dimensions, how important the location is for feeding or breeding and the extent of close-range evasion, all interact to determine the likelihood of entanglement. Based on sightings data, it was predicted that only harbour porpoise, grey seal and otter had the potential to enter the vicinity of Warrior Way (site 6). It is also highly likely that animals would exhibit avoidance, and in addition, numbers of animals likely to be in the area are extremely low. The significance of the effect on all receptors is considered to be minor (adverse).

9.1.1.10 The potential for cumulative effects arising from the proposed activities at the META, in association with other projects was assessed. Projects which could foreseeably overlap temporally or spatially with the META project, or where construction impacts may be consecutive but cumulative, were considered. Underwater noise and increased suspended sediment concentration impacts were considered to have the widest potential impact, and therefore the location of extent of other projects and associated zones of impact were assessed on this basis. Potential impacts considered for cumulative impacts include *increased underwater nose emissions*, *increased vessel collision risk*, *changes to fish and shellfish communities* and *increase in suspended sediment concentration.* All impacts were considered to be minor (adverse), which is not significant in terms of EIA.

9.1.1.11 Inter-related effects were also considered; there was not considered to be any potential marine mammal, basking shark or otter inter-related effects.

9.1.1.12 There is considered to be no potential for significant impacts on marine mammal, basking shark or otter receptors as a result of the META project, however, device-specific otter walkover surveys have been proposed. There is no site-specific information available on otter however the historical records show that this species is distributed widely throughout Pembrokeshire and this region may be a stronghold for otter in the UK. The majority of sightings of otter area are incidental and therefore there are uncertainties in the distribution and abundance of this species in relation to the META sites. The objectives of a device-specific otter survey are to determine whether otter regularly use the habitats around Warrior Way (site 6) at the time of proposed device-deployment and testing activities; and to determine whether otter breed within or near to the habitats around Warrior Way (site 6).

10. MARINE ORNITHOLOGY

10.1.1.1 The marine ornithology chapter identifies a number of seabird species as marine ornithology receptors including Atlantic puffin, guillemot, razorbill, gannet, kittiwake, shag, cormorant, brent goose, waders (13 species including whimbrel, golden plover and greenshank), non-diving ducks (pintail, shoveler, shelduck, mallard, teal and wigeon), diving ducks (scaup, red-breasted merganser, common scoter) and divers (red-throated diver and great northern diver). Atlantic puffin, razorbill, guillemot, and kittiwake are notified interest features of the Skomer, Skokholm and the seas off Pembrokeshire/ Sgomer, Sgogwm a Moroedd Penfro Special Protection Area (SPA).

10.1.1.2 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on marine ornithology receptors have been assessed: *disturbance and displacement; collision with development;* and *accidental pollution.*

10.1.1.3 Potential for displacement and disturbance to occur to coastal birds as a result of an increase in vessel traffic near the META test sites was assessed. Animals may be sensitive to disturbance, particularly during roosting or loafing, and at high tide the sensitivity may be increased as there may be less habitat available compared to low tide for individuals to occupy. Receptors assessed included diving ducks, non-diving ducks and waders and for most receptors the significance of the disturbance effects was assessed as negligible to minor (adverse).

10.1.1.4 The impact assessment considered the potential for an increased risk of collision to sea birds arising from activities associated with the META development including the increase in vessel traffic around the META sites. Sea birds forage at sea, often diving into the water to catch fish. Species with low manoeuvrability and low flight height, such as puffins, razorbills, shags, cormorants and guillemots, may be particularly vulnerable to collision risk from vessels. In addition, species that dive relatively deep to forage – such as scaup, which dives to ~10 m - may risk collision with operational energy devices. A minimum clearance of 2 m will be maintained between turbine blade tips and the surface of the water which will limit the risk of collision. Given the small scale of the META development relative to the extent of habitat over which these species will forage, the risk of collision was considered to be of negligible to minor magnitude and the significance of effects were assessed as negligible to minor for all META sites.

10.1.1.5 Accidental pollution may affect sensitive ornithological receptors where individuals have the potential to be affected where they make contact with pollution in the marine environment, either by resting on the surface or diving to forage. A potential impact pathway therefore exists with all relevant bird species scoped into the assessment. A number of preventative measures will be employed as mitigation to ensure the risks of accidental pollution are minimised and therefore the significance of effect was assessed as negligible for all META sites.

10.1.1.6 Disturbance and displacement may occur as a result of cumulative impacts arising from projects that spatially or temporally overlap with the META project. The cumulative significance of effect of disturbance and displacement on waders and non-diving ducks at high tide was considered to be minor at Warrior Way (site 6) due to increased vessel movements and the proximity of the site to the Cosheston Pill Wetland Bird Survey count sector which has been shown to host important numbers of waders and dabbling ducks. It is however considered unlikely that vessel traffic associated with these developments will result in a cumulative increase in vessel traffic and thus disturbance at Warrior Way (site 6) through spatial overlap. There is the potential for temporal overlap with cumulative projects, and these are assessed as negligible significance. Accidental pollution may occur as a result of cumulative impacts arising from projects that spatially or temporally overlap with the META project. Any accidental pollution could lead to impacts to coastal and marine areas in the Waterway through inappropriate water management or spillages. However, appropriate water management and pollution prevention and control measures would likely be implemented at these sites as part of standard construction practice and as such any impact is considered unlikely. As such the significance of the effect from these activities on the risk of accidental pollution is considered minor (adverse).

10.1.1.7 The greatest potential for inter-related effects are expected to be project lifetime effects of temporary disturbance/ displacement. When temporary habitat loss/disturbance is considered additively across all phases, the total duration of displacement is longer than when considered across an individual phase. The project lifetime of META is estimated at up to 15 years and therefore there is the potential for repeat disturbance/ displacement. Any disturbance will however be highly localised. Therefore, across the project lifetime, the effects on receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.

10.1.1.8 The marine ornithology assessment has concluded that for most species the impacts are not significant (in EIA terms), and therefore no mitigation or monitoring has been proposed.

11. COMMERCIAL FISHERIES

11.1.1.1 Commercial fishing is the activity of catching fish and shellfish for the purpose of making commercial profit. The commercial fisheries that have the potential to be impacted by the META project were characterised through examination of publicly available data-sets and through consultation with local fishermen and stakeholder groups within the Pembrokeshire area. Commercially important species found within the commercial fisheries study area included shellfish (lobster, brown crab and whelks) and bottom-dwelling fish species (bass, haddock and elasmobranchs). These species were found to support a variety of fisheries, including potting, nets, trawling and hand-gathering. Interrogation of the landing data revealed that the most numerous species caught for commercial purposes are mainly shellfish species, whelks, lobster and crabs, with few demersal species caught. Whelk, lobster and crab fisheries were therefore taken forward for assessment. The value of these fisheries was found to be £3.8 million based on an annual average (average over nine years of data).

11.1.1.2 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on commercial fisheries receptors have been assessed: *temporary interference to traditional fishing grounds; temporary loss of traditional fishing grounds* and *damage to fishing equipment.*

11.1.1.3 The impact assessment considered the potential for temporary interference to traditional fishing grounds, via the uplift in vessel numbers associated with the META project, and subsequent interference with commercial vessels. It may also lead to vessels seeking alternate traditional fishing grounds and increasing competition with other fishing vessels. Fisheries likely to be affected by this impact include a potting fishery (lobster, crab, prawn and whelk) and a trawling and netting fishery (bottom set net, otter trawl, beach and beach seine net). Although the seabed type at the three META project sites do not represent preferred potting grounds, these sites are still used to some extend by the local potting fisheries. However, potting vessels are likely to be able to avoid device-deployment areas associated with the META project, and exploit other similar habitats within the local area. All META project sites have a direct overlap with an aspect of the trawling and netting fishery and may cause potential indirect interference to vessels from reaching traditional fishing grounds. The commercial trawling and netting fishery are able to set equipment throughout the commercial fisheries study area and are not restricted to specific areas, such as the potting fishery. In addition, trawling and netting vessels are likely to be able to avoid areas during META project installation activities and exploit other similar habitats within the local area. All receptors were deemed to be of negligible to minor (adverse) significance, which is not significant in terms of EIA.

11.1.1.1 The potential for temporary loss of traditional fishing grounds (potting fishery, trawling, and netting fishery) as a result of installation activities and the presence of marine renewable devices and ancillary equipment was assessed. A loss of fishing grounds could result in a decreased landed weight and therefore value. The impact of any temporary advisory clearance distances and safety zone implementation will be reversible as once the installation of the marine renewable device has occurred, these advisory clearance distances and safety zones will be removed. Installation of a single device at any one time may take place throughout the 15-year consent period, therefore there may be temporary loss of traditional fishing grounds from the META project intermittently throughout this timeframe. Potting, trawling, and netting vessels are all likely to be able to use other areas for deployment of pots, particularly given the extent of available potting habitat throughout the commercial fisheries study area. As such the significance of the effect for all receptors was deemed to be of negligible to minor (adverse) significance, which is not significant in terms of EIA.

11.1.1.2 The potential for damage to fishing equipment as a result of operational activities such as device or navigational buoy anchoring, and the presence of marine renewable devices was assessed. This could lead to a loss in value to the fishery (potting, trawling, and netting) affected. The operation of a single device at any one time may take place throughout the 15-years lifetime of the project, therefore there may be the potential for damage to fishing equipment from the META project during this timeframe. Damage to fishing pots will result in a direct loss of income through the loss of pots and the loss of potential shellfish income, however potting vessels will be able to avoid deployed marine energy devices and exploit other similar habitats within the local area. Any damage to nets may affect the direct income from the result of fish sales and costs of replacing the net, however trawling and netting vessels will be able to avoid deployed marine energy devices and exploit other similar habitats within the local area. As such the significance of the effect for all receptors was deemed to be of negligible to minor (adverse) significance, which is not significant in terms of EIA.

11.1.1.3 Displacement from, and loss of traditional fishing grounds, and damage to fishing equipment may occur as a result of cumulative effects arising from projects that spatially or temporally overlap with the META project. Vessel activity at projects which overlap spatially or temporally is expected to be localised within the sites and therefore unlikely to interfere with commercial fishing vessels which would avoid these areas. In addition, the spatial extent of any impact will be small in the context of the available commercial fishing area, and considering the background levels of vessels and port-related activity. In addition, potting, trawling and netting vessels are likely to be able to avoid any interference and exploit other similar habitats within the local area. As such, the significance of the effect for all potential impacts and for all receptors was deemed to be of negligible to minor (adverse) significance, which is not significant in terms of EIA.

11.1.1.4 Inter-related effects were also considered; there was not considered to be any potential commercial fisheries inter-related effects.

12. SHIPPING AND NAVIGATION

12.1.1.1 Information on Shipping and Navigation within the Shipping and Navigation study area was collected through a detailed desktop review of existing studies and datasets. Suitable Automated Identification System data was analysed and supported by wide stakeholder consultation in order to establish the status of non- Automated Identification System equipped traffic. The Port of Milford Haven is a leading UK shipping gateway handling liquid bulk, break bulk, dry bulk and project cargoes. It is the UK's largest energy port and is capable of delivering 30% of the UK gas demand. The Waterway is also home to Europe's largest gas-fired power station, Pembroke Power Station. Additionally, Milford Haven Docks are home to a fishing fleet, and Pembroke Dock facilitates a twice daily ferry service to Ireland as well as general and project cargo facilities. The Waterway also includes a number of smaller harbours and marinas and is popular with leisure mariners.

12.1.1.2 Navigational features of significance identified include a lighthouse at St Ann's Head, and commercial navigational lights, markers and buoys along the approaches. No formal (i.e. designated) anchorage areas exist in any of the META project sites. Maintenance dredging occurs in several areas of the Waterway and two licenced disposal sites occur in the Waterway and adjacent areas, and there are numerous subsea cables and pipelines. There are also no military exercise areas within the Waterway, though the Castlemartin Training Area Ministry of Defence practice zone lies in close proximity to East Pickard Bay (site 8).

12.1.1.3 The Waterway is managed by the Port of Milford Haven which is responsible for pilotage and conservancy on the Waterway. Warrior Way (site 6) and Dale Roads (site 7) are within the Milford Haven Statutory Harbour Authority and Competent Harbour Authority areas which are managed by Milford Haven Port Authority. East Pickard Bay (site 8) is largely out with the Statutory Harbour Authority area, and therefore MHPA has no statutory duty or powers to direct traffic within the majority of this area.

12.1.1.4 The Waterway provides deep water berths and most vessels have 24-hour tidal access. The Waterway experiences prevailing south-westerly winds. The Waterway is very sheltered, especially from the prevailing south-westerly winds. However, the Dale Roads site (site 7) is exposed to swells and wind from the south, and the East Pickard Bay site (site 8), lying outside the headlands, is very exposed to the prevailing south-westerly weather conditions.

12.1.1.5 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on shipping and navigation receptors have been assessed:, *presence of installation and decommissioning activities and associated vessels may deviate vessel routes leading to a loss of navigable space at Warrior Way (site 6) and increased risk of grounding*; *presence of installation and decommissioning activities and associated vessels, may lead to potential for interaction between leisure users and META activities; physical presence of devices may deviate vessel routes* leading to a loss of navigable space at Warrior Way (site 6) and increased risk of grounding; *physical presence of devices may increase allision risk to vessels not under command (including unattended small craft, capsized craft) and in an emergency situation (e.g. machinery related problems and drifting); physical presence of devices may reduce under keel clearance; physical presence of devices may increase risk of gear/anchor snagging; physical presence of devices may lead to potential for interaction between leisure users and the device.*

12.1.1.6 The impact assessment considered the potential for the presence of installation and decommissioning activities and associated vessels, as well as the physical presence of devices to deviate vessel routes leading to a loss of navigable space at Warrior Way (site 6) and increased risk of grounding. Vessels transiting in the vicinity of Warrior Way (site 6) are most likely to be recreational vessels, high speed craft and tugs/other service vessels, and in practice only a small part of the test area will be used at any one time; the impact of any temporary advisory clearance distances would be reversible. This potential impact is considered within the Navigational Risk Assessment under the hazard "grounding". The overall risk rating was considered to be low (Acceptable). It is anticipated that vessels will be able to transit past the Warrior Way (site 6) site during all phases, and communication via Notices to Mariners would occur in advance. The significance of the affect was therefore deemed to be of minor (adverse) significance.

12.1.1.7 The installation and decommissioning, and physical presence of tidal devices, at Warrior Way (site 6) wave energy devices at Dale Roads (site 7) and wave energy devices and floating wind components at East Pickard Bay (site 8) may present potential for interaction between leisure users and META activities. This potential impact is considered within the NRA under the hazards "contact with fixed structure" and "contact with floating object". The overall risk rating for both was considered to be low (Acceptable). Marine Energy Wales plans to issue Notices to Mariners directly to a database of known users to notify of device-specific installation and decommissioning activities. Any Safety Zones and temporary advisory clearance distances, along with other designed-in measures, will be designed to provide additional separation distance between the installation activities and leisure users. The significance of the effect is therefore deemed to be of minor (adverse) significance.

12.1.1.8 The potential for the physical presence of devices to increase allision risk (the risk of running one vessel against another) to vessels not under command (including unattended small craft, capsized craft) and in an emergency situation (e.g. machinery related problems and drifting) was assessed. Consultation has advised that small craft capsize drills are undertaken in the Warrior Way (site 6) area and stakeholders expressed concern that unattended small craft could drift into the site, and incidents of mechanical failure have been reported in the vicinity of the East Pickard Bay (site 8) site. This potential impact is considered within the NRA under the hazards "contact with fixed structure" and "contact with floating object". The overall risk rating was considered to be low (Acceptable) for both. There are a number of existing risk control measures within the Statutory Harbour Authority area which will continue to remain in place during the operation of the META test areas. Other designed-in measures specific to the META project include promulgation of information including Notices to Mariners and onshore signage where appropriate and possible, appropriate navigational marking, charting, use of safety vessels/guard boats during short-term deployments and the implementation of an Operational Management Plan (including Emergency Response). The significance of the effect has been assessed as minor (adverse) significance.

12.1.1.9 The potential for the physical presence of devices to reduce under keel clearance and to increase the risk of gear/anchor snagging was assessed. At the META project sites there is the potential for devices to occupy all or part of the water column, the potential for surface piercing, at sea surface components, and sub-surface components. The presence of tidal devices, wave devices or floating offshore wind components and associated moorings, may increase risk of gear/anchor snagging. The Navigational Risk Assessment assessed the hazards "contact with fixed structure" and "contact with floating object" for each site, and the overall risk rating for both was considered to be low (Acceptable). The presence of the devices at each of the test sites and any associated moorings would be communicated in advance via Notices to Mariners, and other designed-in measures include appropriate navigational marking and charting at each of the test sites, which will alert mariners to the presence of the devices. The significance of the effects was assessed as negligible.

12.1.1.10 Increased allision risk to vessels not under command (including unattended small craft, capsized craft) and in an emergency situation (e.g. machinery related problems and drifting), reduced under keel clearance, and increased risk of gear/anchor snagging may occur as a result of cumulative effects arising from projects that spatially or temporally overlap with the META project. Risk control measures already exist in the area and designed-in measures will be implemented for each of these impacts. As such, the significance if the effects is assessed as negligible to minor (adverse) significance, which is not significant in EIA terms.

12.1.1.11 Likely inter-related effects include project lifetime effects (deviated vessel routes and potential for interaction between leisure users and META activities) and receptor-led effects (interaction of deviated vessel routes, potential for interaction between leisure users and META activities, allision risk to vessels not under command and in an emergency situation, reduced under keel clearance and risk of gear/anchor snagging, for recreational vessels). Across the project lifetime, the effects on Shipping and Navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase. It is also predicted that the interaction of impacts will not be any more significant than the individual impacts in isolation; these interactions are predicted to be no greater than the individual effects assessed in isolation.

12.1.1.12 Designed-in measures include promulgation of information including Notices to Mariners; navigational marker buoys and/or other Aids to Navigation; marine charting; Safety Zones may be applied around any pin piling activities taking into consideration local conditions and traffic; advisory clearance distances around project vessels undertaking installation, decommissioning and operational activities; the consideration of the use of safety vessels; compliance with International Maritime Organisation Conventions; and META project Operational Management Plan (including emergency response).

13. MARINE ARCHAEOLOGY

13.1.1.1 Warrior Way (site 6) falls within the registered landscape of Milford Haven Waterway. A review of marine archaeological data has returned no designated or non-designated sites within Warrior Way (site 6), however, two non-designated heritage assets were identified for this site including Areas 46 and 45 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports and Harbours" survey (coinciding with Warrior Way). Area 46 shows the occurrence of prehistoric deposits within the local area which may be affected by the proposed activities. This was categorised as an area of possible sediment with medium archaeological potential, an acoustic survey has been undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest. Area 45 (Major Bay/Landing Points) was deemed to be of high archaeological potential, however, the archaeological potential for the site is assessed as low as Area 45 lies to the southern edge of Warrior Way (site 6), in the centre of the waterway, and therefore furthest from the landing points.

13.1.1.2 Dale Roads (site 7) falls within the registered landscape of Milford Haven Waterway. A review of marine archaeological data has returned no designated sites within the Dale Roads (Site 7), however a number of non-designated heritage assets were identified for this site including Areas 23, 34 and 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment). Area 23 was categorised as an area of possible sediment with medium archaeological potential. An acoustic survey has been undertaken in this area which suggests some sediment of Palaeolithic/Mesolithic interest may survive. Area 34 (Major Bay / Landing Point) was deemed to be of high archaeological potential for material culture associated with the use of Dales Road as a major bay / landing point in the post-Medieval and Modern periods, however, low archaeological potential for the early pre-historic and post-Medieval period is assessed for the site due to distance to Dale Roads bay itself. This area was not covered by surveys or boreholes, but sediment survival is considered likely. Area 25 (Lindsway Bay) is deemed to be of medium archaeological potential for the early Prehistoric, post-Medieval and Modern periods as a small sandy bay, without easy access and therefore likely to have seen little use. Levels suggest possible sediment survival, but the area has not been surveyed or bore-holed.

13.1.1.3 East Pickard Bay (site 8) falls within the South Pembrokeshire Heritage Coast. A review of marine archaeological data has returned no designated sites within East Pickard Bay (site 8), however a number of non-designated heritage assets were identified for this site. An unnamed wreck / 'Highland Home' was identified and this site has high potential for deposits dated to the post-Medieval period, specifically associated with the wreck mapped on site, believed to be the Highland Home. East Pickard Bay (site 8) has medium potential for archaeological deposits dating to the Prehistoric period associated with the proximal record of a Prehistoric submerged forest and finds on the intertidal zone in the proximity of West Pickard Camp. There was also low archaeological potential for unknown wrecks dating to the post-Medieval Modern period to be located within the site.

13.1.1.4 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on marine archaeological receptors have been assessed, namely, *removal or disturbance of sediments – buried prehistoric deposits; removal or disturbance of archaeological resource – shipwrecks;* and *sediment deposition on the seabed*.

13.1.1.5 The impact assessment considered the potential for removal or disturbance of the sediments during all phases of the META project to result in effects on near-surface or deeply buried prehistoric deposits. The prehistoric deposits at all three sites were considered to be of medium archaeological vulnerability and the assessment concluded that the effect would be of minor (adverse) significance. Mitigation may be required to micro-site devices and this will be determined through the assessment, by an experienced marine archaeologist, of survey data from any pre-installation surveys that may be required by device-developers.

13.1.1.6 Installation and decommissioning activities leading to removal or disturbance of archaeological deposits and maintenance activities including the deployment of vessel moorings, may affect a variety of heritage assets resulting in a potential effect on shipwrecks, should they be present within each site. Marine archaeological resources, which included shipwrecks, were considered to be of low archaeological vulnerability and the assessment concluded that the effect would be of minor (adverse) significance. Mitigation may be required to micro-site devices and this will be determined through the assessment, by an experienced marine archaeologist, of survey data from any pre-installation surveys that may be required by device-developers.

13.1.1.7 There is potential for sediment deposition during the installation (and decommissioning) of marine renewable devices at all sites to result in a potential effect on a variety of heritage assets. The Coastal Processes assessment (chapter 5) concluded that the very finest material disturbed from installation and decommissioning activities would travel in the order of 100 m from the Warrior Way site (site 6), 600 m from the Dale Roads site (site 7); and 50 m from the East Pickard Bay site (site 8) during an average tide. Sensitive receptors included Prehistoric deposits and archaeological resources (including wrecks) and all were deemed to be of low archaeological vulnerability to this impact. The significance of the effect was therefore considered to be of negligible to minor (adverse) significance and no further mitigation or monitoring was proposed.

13.1.1.8 Removal or disturbance of sediments – buried prehistoric deposits, removal or disturbance of archaeological resource – shipwrecks, and sediment deposition on the seabed may occur as a result of cumulative effects arising from projects that spatially or temporally overlap with the META project. The cumulative assessment deemed that significance of effects were of negligible to minor (adverse) significance, which is not significant in terms of EIA.

13.1.1.9 Inter-related effects were also considered; there was not considered to be any potential marine archaeology inter-related effects.

13.1.1.10 There is considered to be no potential for significant impacts on marine archaeological receptors as a result of the META project, and therefore no mitigation or monitoring is considered necessary.

14. SEASCAPE

14.1.1.1 The analysis of visual constraints includes the identification of representative views towards each of the three META project sites, which are generally from a range of visual receptors, both public (highways and public rights of way) and private (residential properties). The seascape visual assessment combines the results of both an objective and subjective appraisal of the seascape. This appraisal consisted of three stages including a desk study, a field survey and an analysis of the likely effects resulting from the proposed development in light of these studies.

14.1.1.2 At Warrior Way (site 6), the seascape can be described as an intensely used urban waterway, littered with recreational floating craft and yachts, maker buoys, and commercial shipping. Key sensitivities at Warrior Way (site 6) are popular recreational destinations for visitors and recreational boating; designation of Milford Haven Waterway Registered Landscape of Outstanding Historic Interest in Wales; walkers using the Pembrokeshire Coast Path; and viewpoints from the Cleddau Bridge and across the Daugleddau from publicly accessible coastal viewpoints in Burton Ferry.

14.1.1.3 At Dale Roads (site 7) the seascape can be described as open sea character with strong currents and swells with red steep sandstone cliffs and sheltered bays. Key sensitivities at Dale Roads (site 7) are, red steep sandstone cliffs and sheltered bays; popular recreational destinations for visitors and recreational boating; designation of Milford Haven Waterway Registered Landscape of Outstanding Historic Interest in Wales; and walkers using the Pembrokeshire Coast Path.

14.1.1.4 At East Pickard Bay (site 8) the seascape can be described as wild and exposed, made up of large, exposed south facing jagged sandstone cliffs with the beach at Freshwater. Key sensitivities at East Pickard Bay (site 8) are, remote, unspoilt sweep of beaches and dune systems with craggy cliffs; wide views across the bay and to focal points such as St Ann's Head; tranquillity when no firing on ranges; important recreational destination; and walkers using the Pembrokeshire Coast Path.

14.1.1.5 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on seascape receptors have been assessed: visual impact for recreational receptors using the Waterway for recreational boating at all sites; Warrior Way (site 6) and Dale Roads (site 7) - Impact on the Designation of Milford Haven Waterway Registered Landscape of Outstanding Historic Interest in Wales; Warrior Way (site 6) - Impact from viewpoints for receptors using the Pembrokeshire Coast Path along the Cleddau Bridge and across the Daugleddau from publicly accessible coastal viewpoints in Burton Ferry (VP1 and VP2); Dale Roads (site 7) – Visual impact from viewpoints for receptors using the Pembrokeshire Coast Path (View Point 3, View Point 4 and View Point 5); East Pickard Bay (site 8) - Impact on remoteness, unspoilt sweep of beaches and dune systems with craggy cliffs and tranquillity when no firing at Ministry of Defence ranges in the National Park; Impact on wide views across the bay and to focal points such as St Ann's Head; Visual impact from viewpoints for receptors using the Pembrokeshire Coast Path (View Point 6, View Point 7 and View Point 8).

14.1.1.6 The impact assessment considered the potential for visual impact for recreational receptors using the Waterway and surrounding area for recreational boating at Warrior Way (site 6), Dale Roads (site 7), and East Pickard Bay (site 8) at all phases. Due to the function of the Waterway as a busy route to the port for commercial shipping and for recreational boating concurrent with a number of dominant buildings in an elevated format forming the backdrop in the distance, there are a number of factors that detract from sensitivity. Whilst East Pickard Bay (site 8) is less busy, the commercial shipping route to the port lies in the seascape to the west with large ships visible in the background. LANDMAP identifies the context at Warrior Way (site 6) and Dale Roads (site 7) as being of medium sensitivity, and identifies the coastline at East Pickard Bay (site 8) as being of outstanding value. During the installation and decommissioning phases at Warrior Way (site 6) and Dale Roads (site 7), there will be up to five vessels utilised at any one time, with up to 20 deployment and 20 retrieval vessels operations in a 12-month period. At East Pickard Bay (site 8) there will be up to five vessels utilised at any one time, with up to 40 deployments and 40 retrievals vessel operations within a 12-month period. The significance of the effect is deemed to be of negligible to minor (adverse) significance), which is not significant in EIA terms. At all three sites, during the operational and maintenance phase, the maximum design scenario includes either a single device projecting up to 2 m over an area of up to 200 m² (Warrior Way (site 6)) or over 600 m^2 (Dale Roads (site 7)) or up to 15 m over an area of 3,600m^2 or 5 m over an area of 33,810 m² (East Pickard Bay (site 8). Receptors using the Waterway and surrounding area will generally be moving and will be within boats. The impact is considered to be direct or indirect, long-term, intermittent and reversible. The significance of the effect is deemed to be of minor (adverse) to substantial (adverse) significance, which is significant in EIA terms. The most likely scenario deems the significance of the effect to be of negligible or minor (adverse) significance, which is not significant in EIA terms.

14.1.1.7 The impact assessment considered the potential for an impact on the designation of Milford Haven Waterway Registered Landscape of Outstanding Historic Interest in Wales at Warrior Way (site 6) and Dale Roads (site 7) at all phases. Pembroke Dock historic landscape character area comprises the 19th century naval dockyards, and the 19th century grid-pattern planned town, and the Waterway and port is littered with evidence of commercial shipping and recreational boating including marker buoys and a variety of floating vessels ranging from small craft, yachts, tug boats and ferry ships to oil tankers. At the installation and decommissioning phases, the visible elements of the maximum design scenario for both META sites is up to five vessels utilised for deployment and retrieval operations at any one time with up to 20 deployment and 20 retrieval vessels operations in a 12- month period. At the operational phase, the visible elements of the META project at Warrior Way (site 6) and Dale Roads (site 7) include a single device projecting up to 2 m over an area of up to 200 m², up to four navigational marker buoys, a test support buoy and increased vessel activity, which will form common elements within the wider seascape. LANDMAP identifies the context as being of moderate sensitivity at both sites, during all phases. Due to the function of the Waterway at Warrior Way (site 6) and Dale Roads (site 7) as a port and for recreational boating concurrent with a number of dominant built structures adjacent (Cleddau Bridge and port buildings), there are a number of factors that detract from sensitivity. The significance of the effect at the installation and decommissioning phases is deemed to be of negligible significance. The significance of the effect at the operational and maintenance phase at Warrior Way (site 6) is deemed to be of minor (adverse) significance, which is not significant in EIA terms, and at Dale Roads (site 7) to be of moderate (adverse) significance, which is significant in EIA terms. The most likely scenario deems the significance of the effect to be of negligible or minor (adverse) significance at both sites, which is not significant in EIA terms.

14.1.1.8 The impact assessment considered the potential for visual impact at Warrior Way (site 6) - impact from viewpoints for receptors using the Pembrokeshire Coast Path along the Cleddau Bridge, and across the Daugleddau from publicly accessible coastal viewpoints in Burton Ferry (VP1 and VP2), at all phases. . Receptors using the Pembrokeshire Coast Path along the Cleddau Bridge and the public road in Burton, will generally be moving as walkers (slow moving) and within vehicles (fast moving). Due to the function of this part of the Waterway as a port and for recreational boating concurrent with a number of dominant built structures adjacent (Cleddau Bridge and port buildings) there are a number of factors that detract from sensitivity. As such, the change in the baseline view is expected to be minor, and receptors are deemed to be of low vulnerability and full recoverability at all phases. The significance of the effect is deemed to be of negligible to minor (adverse) significance, which is not significant in EIA terms.

14.1.1.9 The impact assessment considered the potential for visual impact from viewpoints for receptors using the Pembrokeshire Coast Path (View Point 3, View Point 4 and View Point 5) at Dale Roads (site 7) at all phases. The Waterway and port is littered with evidence of commercial shipping and recreational boating, and the oil refinery structures and vertical elements of the power stations elevated on the cliffs above the Waterway edges are visible in the view back towards the inner Waterway. Receptors using the Pembrokeshire Coast Path will generally be moving slowly (walkers). Due to the function of this part of the Waterway as a commercial shipping route to the port and for recreational boating concurrent with a number of dominant built and industrial structures in an elevated position forming the backdrop, there are a number of factors that detract from sensitivity. As a well-used public right of way located in the National Park, the receptors using the Pembrokeshire Coast Path are deemed to be of high vulnerability even though the change in the baseline view will be moderate. The significance of the effect in the installation and decommissioning phases is deemed to be of minor (adverse) significance, which is not significant in EIA terms. The significance of the effect in the operational and maintenance phase is deemed to be of moderate (adverse) significance, which is significant in EIA terms. The most likely scenario deems the significance of the effect to be of minor (adverse) significance, which is not significant in EIA terms.

14.1.1.10 The impact assessment considered the potential for impact on remoteness, unspoilt sweep of beaches and dune systems with craggy cliffs and tranquillity when no firing at Ministry of Defence ranges in the National Park at East Pickard Bay (site 8) at all phases. This seascape is open and rugged with evidence of recreational boating, including markers buoys. The commercial shipping route to the port lies in the seascape to the west of the site, with large ships visible in the background. The shoreline and cliffs are rugged and undeveloped. Due to the function of this part of the seascape for recreational boating and the presence of commercial shipping in the background on route to the port for commercial shipping, mooring of occasional ships and the Ministry of Defence firing range, there are some factors that detract from sensitivity. However, the coastline is rural and undeveloped. The significance of the effect in the installation and decommissioning phases is deemed to be negligible, which is not significant in EIA terms. The significance of the effect at the operational and maintenance phase is deemed to be of substantial (adverse) significance, which is significant in EIA terms. The most likely scenario deems the significance of the effect to be of minor (adverse) significance, which is not significant in EIA terms.

14.1.1.11 The impact assessment considered the potential for impact on wide views across the bay and to focal points such as St Ann's Head East Pickard Bay (site 8) at all phases. LANDMAP identifies the coastline as being of outstanding value. Due to the function of this part of the seascape for recreational boating and the presence of commercial shipping in the background on route to the port for commercial shipping, and mooring of occasional ships and the Ministry of Defence firing range, there are some factors that detract from sensitivity. However, the coastline is rural and undeveloped. The significance of the effect at the installation and operational phases is deemed to be of minor (adverse) significance, which is not significant in EIA terms. The significance of the effect during the operation and maintenance phase is deemed to be of substantial (adverse) significance, which is significant in EIA terms. The most likely scenario deems the significance of the effect to be of minor (adverse) significance, which is not significant in EIA terms.

14.1.1.12 The impact assessment considered the potential for visual impact from viewpoints for receptors using the Pembrokeshire Coast Path (View Point 6, View Point 7 and View Point 8) at East Pickard Bay (site 8) at all phases. Receptors using the Pembrokeshire Coast Path will generally be moving as walkers (slow moving). The shoreline and cliffs are rugged and undeveloped. Recreational boating and commercial shipping in the wider seascape to the west means there are some factors that detract from sensitivity. As a well-used public right of way located in the Pembrokeshire Coast National Park, the receptors are deemed to be of high vulnerability. The significance of the effect at the installation and decommissioning phases is deemed to be of minor (adverse) significance, which is not significant in EIA terms. The significance of the effect at the operational and maintenance phase is deemed to be of substantial (adverse) significance, which is significant in EIA terms. The most likely scenario deems the significance of the effect to be of minor (adverse) significance, which is not significant in EIA terms.

14.1.1.13 A cumulative visual impact at East Pickard Bay (site 8) may occur as a result of cumulative effects arising from projects that spatially or temporally overlap with the META project (specifically the Greenlink Interconnector Cable, the proposed Bombora Wave Energy project and the Ministry of Defence project). This seascape is open and rugged and with evidence of recreational boating including markers buoys. The commercial shipping route to the port lies in the seascape to the west of the site with large ships visible in the background. The shoreline and cliffs are rugged and undeveloped. The visible elements of the projects will result in increased vessel movements, likely to be indirect, short-term, intermittent and reversible. LANDMAP identifies the coastline as being of outstanding value. Due to the function of this part of the seascape for recreational boating and the presence of commercial shipping in the background on route to the port for commercial shipping, mooring of occasional ships and the Ministry of Defence firing range, there are some factors that detract from sensitivity. However, the coastline is rural and undeveloped. Based on the maximum design scenario, the cumulative effect is deemed to be of substantial (adverse) significance.

14.1.1.14 Inter-related effects were also considered; there was not considered to be any potential seascape inter-related effects.

15. SOCIO-ECONOMIC AND TOURISM

15.1.1.1 Statistics report a resident population of 124,700 persons in Pembrokeshire, which has increased by 4.3% over the ten-year period 2007-17. The Pembrokeshire economy is dominated by micro businesses, which have increased in number between 2014 and 2018 and the survival rate of new enterprises in Pembrokeshire is higher than the Wales average. Economic activity rate in Pembrokeshire is lower than the Wales and Great Britain average, however employment rate is higher than the Wales average. Self-employment is very high in Pembrokeshire. The tourism sector is very well represented in Pembrokeshire in terms of employment, and the human health and social work activities sector holds the highest representative number of workers in Pembrokeshire. Whilst the employment and economic activity rates in Pembrokeshire indicate labour market participation levels in Pembrokeshire are at or above the Welsh average, this is based on high levels of self-employment and part-time working. The occupational and skills data shows a low concentration of high skilled, higher order activity, and surveys report that earnings in Pembrokeshire are much lower than in Wales as a whole. Travel to work patterns indicate a functional economic area that is contained almost entirely within Pembrokeshire local authority. The energy sector, heavily biased towards oil and gas in Pembrokeshire, directly supports 137 full-time equivalent jobs and 350 person-years of employment in Wales, and it is anticipated that the marine energy sector will invest £1.4 billion between 2017 and 2022. Tidal energy represents the largest share of these figures, with wave energy representing a smaller share of the marine energy sector. The total number of visitors to Pembrokeshire per annum amounts to 4.3 million, of which 2 million are day visitors and this sector contributed £37.7 million of direct revenue to Pembrokeshire's tourism economy in 2015, accounting for 10.4% of Pembrokeshire economy's total direct revenue from tourism, and in employment terms this sector accounted for 6.6% of the Pembrokeshire economy's total direct employment relating to tourism in 2015.

15.1.1.2 A number of potential impacts associated with the installation, operation and maintenance, and decommissioning phases of the META project on socio-economic and tourism receptors have been assessed: *impact on design and research and development employment and gross value added in the renewable energy sector; impact on installation and deployment, operation and maintenance, and decommissioning related employment and gross value added*; *impact on access to installation and deployment, operation and maintenance, and decommissioning related employment opportunities amongst residents; impact on demand for housing, accommodation and local services; impact on the performance of the renewable energy sector; impact on offshore and coastal tourism and recreation activity and associated economic value;* and *impact on local tourism and recreational resources.*

15.1.1.3 The impact assessment considered the potential for impact on design and research and development employment and gross value added in the renewable energy sector. The META project creates the opportunity to attract new and existing developers to locate part or all of their operations within Pembrokeshire and Wales, providing an attractor for design and research and development, as well as supporting the growth of developers already located in the area. There will also be further induced effects through the expenditure of earned wages from new jobs created, and of benefit given the low average wages within Pembrokeshire. Anticipated effects will be long-term or permanent. It is reasonable to expect that the majority of employment and gross value added gains would not occur for developers at the Wales level and below without the META project, given the lack of consented sites available for testing and deployment. The significance of the effect is therefore deemed to be of moderate (beneficial) significance, which is significant in terms of EIA.

15.1.1.4 The impact assessment considered the potential for impact on installation and deployment, operation and maintenance, and decommissioning related employment and Gross Value Added. The industries most closely associated with the META project activity will be those related to engineering activities. Device-specific related activities will also create additional demand within the seaborne haulage sector and is likely that developers would locate these jobs in Pembrokeshire. These impacts are assessed as long-term and ongoing. It is reasonable to assume the META project will have an additive effect on activity in the marine energy industry, and the significance of the effect is therefore deemed to be of minor to moderate (beneficial) significance, which is significant in terms of EIA.

15.1.1.5 The impact assessment considered the potential for impact on access to installation and deployment, operation and maintenance, and decommissioning related employment opportunities amongst residents. The creation of new employment roles in Pembrokeshire will therefore create opportunities for Pembrokeshire residents, which are expected to attract a wage premium. It is expected that there is potential for a proportion of lower skilled roles to be filled by Pembrokeshire residents, but higher order occupations would likely be filled by workers outside of Pembrokeshire or upskilling existing residents and workers to meet the needs of employers. This could have a displacing effect on economic activity in Pembrokeshire with the potential effect of supporting structural change in the economy or creating further back filling opportunities, and these employment opportunities would not exist in Pembrokeshire without the META project. The significance of the effect is therefore deemed to be of minor to moderate (beneficial) significance, which is significant in terms of EIA.

15.1.1.6 The impact assessment considered the potential for impact on demand for housing, accommodation and local services. The expected increase in employment opportunities is likely to stimulate in-migration of high-skill workers to fill jobs in technical engineering disciplines. An increase in population, either temporary or permanent, is neither positive nor negative. Topic areas to consider include housing; temporary accommodation; and education, health and other services. The META project will support additional employment opportunities, which is likely to support a small amount of in-migration to Pembrokeshire. Therefore, the significance of the effect is deemed to be of negligible to minor (possibly adverse, neutral or beneficial) significance, which is not significant in terms of EIA. There is a level of uncertainty attached to this level of significance. This uncertainty has been addressed through expressing the assessment of effects as a range.

15.1.1.7 The impact assessment considered the potential for impact on the performance of the renewable energy sector. Developing the renewable energy sector in Wales, for both energy supply and economic benefit is a key priority; the marine energy sub-sector is currently small in Wales but has substantial opportunity if the correct infrastructure is put in place to support its growth. The META project will establish Pembrokeshire as one of a limited number of locations in the UK with consented test sites and therefore presents a clear opportunity for Pembrokeshire to be firmly established as one of the UK's primary locations for marine energy research and development and production as the sector grows. The impacts on the renewable energy sector, and particularly the marine renewables sub-sector will reach across Pembrokeshire, Wales and have potential to impact at the UK and international level. Therefore, the significance of the effect is deemed to be of moderate (beneficial) significance, which is significant in terms of EIA.

15.1.1.8 The impact assessment considered the potential for impact on offshore and coastal tourism and recreation activity and associated economic value. This impact is a secondary effect resulting from the primary effects discussed in Chapter 16: Other Users. There is potential for the primary effect of changes to the wave regime on surfing conditions in East Pickard Bay (site 8). Activities at the META project sites may displace recreational activities from the footprint of the development and from any areas subject to temporary advisory clearance distances, resulting in a loss of recreational resource. The amount of activity displaced is likely to be minimal, particularly given that, for the most part, interference with recreation activities will be limited to diverting around devices. It is anticipated that recreational vessels will be able to transit past any of the META project sites, or else find alternative suitable locations to carry out their activity. In addition, the presence of the devices and activities would be communicated in advance. The significance of these primary effects is categorised in chapter 16: Other Users as negligible to minor adverse, which is not significant in EIA terms. Similarly, the significance of any secondary effects on socio-economic and tourism receptors can be categorised as negligible to minor adverse.

15.1.1.9 The impact assessment considered the potential for impact on local tourism and recreational resources. This impact is a secondary effect resulting from the primary effects discussed in chapter 14: Seascape. There is potential for impact on the designation of Milford Haven Waterway as a Registered Landscape of Outstanding Historic Interest in Wales. Chapter 14: Seascape assesses the magnitude of this impact at Warrior Way (Site 6) as Negligible during the construction phase and Minor during the operational phase. At Dale Road (Site 7) the magnitude is assessed as Negligible during the construction phase and Moderate during the operational phase. There is potential for visual impact during construction and operational phases. During the construction phase, chapter 14: Seascape assesses the magnitude of this impact as Negligible across all three sites. During the operational phase, chapter 14: Seascape assesses the magnitude of this impact as Moderate at Warrior Way (Site 6) and Dale Road (Site 7), and Substantial at East Pickard Bay (Site 8). Any displacement of tourism activity as a result of these impacts is anticipated to be Negligible.

15.1.1.10 There is existing evidence of commercial shipping, recreational boating, slipways, and moorings in parts of the Waterway, with tall refinery and power station structures also visible along the shoreline. These factors detract from the level of sensitivity of this impact. The significance of any secondary effects related to these impacts on socio-economic and tourism receptors can be categorised as negligible or minor which is not significant in EIA terms.

15.1.1.11 Cumulative impacts upon socio-economic and tourism receptors may occur as a result of cumulative impacts arising from projects that spatially or temporally overlap with the META project (specifically Pembroke Dock Infrastructure, Pembrokeshire Demonstration Zone, Greenlink, the proposed Bombora Wave Energy project, the University College of Swansea, and META Phase 1). The cumulative impact assessment deemed there to be either no change to the impact assessment for design and research and development employment and Gross Value Added in the renewable energy sector; a change from minor – moderate (beneficial) to moderate (beneficial) for installation and deployment, operation and maintenance, and decommissioning related employment and Gross Value Added and access to installation and deployment, operation and maintenance, and decommissioning related employment opportunities amongst residents; or a change from moderate (beneficial) to major (beneficial) for the performance of the renewable energy sector.

15.1.1.12 Inter-related effects were considered; there was not considered to be any potential socio-economic or tourism inter-related effects.

15.1.1.13 No mitigation or monitoring measures associated with the META project have been proposed in relation to socio-economic and tourism receptors.

16. OTHER USERS

16.1.1.1 The Waterway is shared by a number of different activities and interests including recreational activities, fishing, commercial shipping, port activities, subsea cables and pipelines, dredging and disposal. These activities are managed on a day to day basis by the Milford Haven Port Authority in collaboration with community stakeholders and partner organisations, and coexistence is achieved through established communications and operating procedures (including bye-laws, Notices to Mariners, and Water Ranger patrols). The level of recreational activity varies depending on the season. Most of the activity in the Waterway is seasonal, increasing from April to August and then declining in September. Recreational activities include power-boating, kayaking, jet skiing, wake boarding, water skiing, sailing, coasteering and rowing. Consultation has advised that Warrior Way (site 6) is the most intensively used of the three META project sites for leisure navigation.

16.1.1.2 The impact assessment considered the potential for the installation, operation and maintenance and decommissioning phases to displace recreational activities resulting in a loss of recreational resource. Recreational activities may be displaced from the footprint of the development and from any areas subject to temporary advisory clearance distances as a result of installation and decommission activities, and as a result of the presence of marine energy devices and ancillary equipment. The spatial extent of a single device at both Warrior Way (site 6) and Dale Roads (site 7) for both the maximum design scenario (0.00035 km^2, 0.000800 m^2, respectively) and most likely design scenario (0.000175 km^2, 0.000300 m^2, respectively) is small in the context of the proposed test area (0.093 km^2, 0.195 km^2, respectively) and in the wider context of the available recreational resource in the Waterway. At East Pickard Bay (site 8) the maximum spatial extent of the device deployments and associated moorings at East Pickard Bay (site 8) would occupy less than half of the area within the proposed test area boundary (approximately 1.2 km^2). It is considered that there will still be sufficient passing distance for recreational vessels, and other activities such as jet skiing and kayaking will be excluded from the device deployment area and the impact of any temporary advisory clearance distances would be reversible, short-term and intermittent, as once each device has been installed these will be removed. Activities taking place closer to shore and on the beach at Freshwater West such as surfing, body-boarding and kite boarding are not expected to be displaced during installation activities. The significance of the effect at all three sites is considered to be of minor (adverse) significance, which is not significant in terms of EIA.

16.1.1.3 Cumulative displacement of recreational activities at Warrior Way (site 6) and East Pickard Bay (site 8) may occur as a result of cumulative effects arising from projects that spatially or temporally overlap with the META project. No cumulative impacts are predicted for Dale Roads (site 7). The spatial extent of any cumulative impact at Warrior Way (site 6) will be small in the context of the available recreational resource in the Waterway and considering background levels of vessel and port-related activity in the vicinity. In addition, it is anticipated that recreational vessels will be able to transit past a single device within the overall Warrior Way (site 6) site boundary, and other projects and plans during installation and operational and maintenance activities. At East Pickard Bay (site 8) the total loss of recreational resource is relatively small in the context of the available resource in the wider Waterway and south and west Pembrokeshire; any cumulative displacement will be temporary and will occur over a relatively short duration. In addition, alternative locations are available, if required for kayaking, kite surfing, windsurfing and power boating within the Waterway and across south and west Pembrokeshire during installation of the META devices, the Greenlink Interconnector project and the proposed Bombora project. The significance of the effect is therefore deemed to be of minor (adverse) significance.

16.1.1.4 Inter-related effects were considered; there was not considered to be any potential other users inter-related effects.

16.1.1.5 No mitigation or monitoring measures associated with the META project are proposed relating to other users receptors.

16.1.1.6 Promulgation of information including regular Notices to Mariners will be issued before and during every device deployment, advising on the location, timings and other relevant information, and information and notices will also be posted at onshore locations where appropriate and possible, which may include signage if appropriate and possible. In addition, Safety Zones may be applied for, around any pin piling activities during the installation phase, taking into consideration the local conditions and traffic at the time. Finally, advisory clearance distances are likely to be recommended around vessels undertaking installation, maintenance and decommissioning activities. The nature of the advisory clearance distances will be discussed and agreed with the Milford Haven Port Authority on a case-by-case (device-specific) basis.