MARINE ENERGY WALES

MARINE ENERGY TEST AREA (META)

Environmental Impact Assessment

Chapter 12:
Shipping and Navigation

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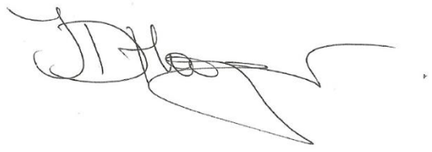
Jessica Hooper  2019-12-05

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Prepared by:

RPS Energy Ltd.

Prepared for:

Marine Energy Wales

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Glossary

Term	Definition
Allision	A violent contact between a vessel and a fixed structure (MCA, 2013).
Contact	A vessel striking, or being struck, by an external object that is not another vessel or the sea bottom (MCA, 2013).
Formal Safety Assessment	A rational and systematic process for assessing the risk associated with an activity and for evaluating the costs and benefits of options for reducing these risks (MCA, 2013).
Grounding	The ship coming to rest on, or riding across underwater features or objects, but where the vessel can be freed from the obstruction by lightning and/or assistance from another vessel (e.g. tug) or by floating off on the next tide (MCA, 2013).
Vessel Not Under Command (NUC)	A vessel which through some exceptional circumstance is unable to manoeuvre as required by Convention on International Regulations for Preventing Collisions at Sea (COLREGS) rules and is therefore unable to keep out of the way of another vessel.

Acronyms

Acronym	Description
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
AtoN	Aids to Navigation
CGOC	Coastguard Operations Centre
CHA	Competent Harbour Authority
EIA	Environmental Impact Assessment
HMCG	Her Majesty's Coastguard
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
META	Marine Energy Test Areas
MEW	Marine Energy Wales
MGN	Marine Guidance Note
MHPA	Milford Haven Port Authority
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
PPSA	Pembrokeshire Performance Sailing Academy
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NRW	Natural Resources Wales
OREI	Offshore Renewable Energy Installations
PDE	Project Design Envelope
RNLI	Royal National Lifeboat Institution
SAR	Search and Rescue
SHA	Statutory Harbour Authority
STCW	Standards of Training Certification and Watchkeeping
THLS	Trinity House Lighthouse Authority
VTS	Vessel Traffic Service

Units

Unit	Description
km	Kilometre
m	Metre
m^2	Metres squared
m/s	Metres per second
NM	Nautical Mile

12. SHIPPING AND NAVIGATION

12.1 Introduction

12.1.1.1 This chapter of the Environmental Statement presents the results of the Environmental Impact Assessment (EIA) for the potential impacts of the META project on Shipping and Navigation. Specifically, this chapter considers the potential impact of the META project seaward of Mean High Water Springs (MHWS) during its installation, operation and maintenance, and decommissioning phases.

12.1.1.2 The assessment presented is informed by the following technical appendix:

- Appendix 12.1: Navigational Risk Assessment (NRA).

12.2 Purpose of this chapter

12.2.1.1 The primary purpose of the Environmental Statement is to support the marine consent applications for the META project, which are outlined in chapter 1.

12.2.1.2 It is intended that the Environmental Statement will provide statutory and non-statutory consultees with sufficient information to determine the potential significant impacts of the META project on the receiving environment and will inform the issue of appropriate consent and/or licences by the regulatory authorities. It will also inform any consent conditions.

12.2.1.3 In particular, this Environmental Statement chapter:

- Presents the existing environmental baseline established from desk studies and consultation;
- Presents the potential environmental effects on Shipping and Navigation arising from the META project, based on the information gathered and the analysis and assessments undertaken;
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

12.3 Study area

12.3.1.1 The Shipping and Navigation Study Area includes all Shipping and Navigation receptors within an area which has the potential to be affected by the META project. The Shipping and Navigation Study Area encompasses the three META project sites of Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) and extends to include the context of the wider Milford Haven Waterway (hereafter referred to as 'the Waterway') and immediate approaches. The Shipping and Navigation Study Area is shown in Figure 12.1.

12.4 Policy context

12.4.1 National Policy Statements

12.4.1.1 While it is recognised that the META project does not constitute a Nationally Significant Infrastructure project (NSIP), the National Policy Statements (NPS) available to support NSIPs are considered to provide useful context to the EIA for the potential impacts of the META project on Shipping and Navigation.

12.4.1.2 Planning policy on renewable energy infrastructure is contained in the Overarching NPS for Energy (EN-1; DECC, 2011a) and, specifically in relation to Shipping and Navigation, the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b).

12.4.1.3 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 12.1 below.

12.4.1.4 NPS EN-3 also highlights several factors relating to the determination of an application. These are summarised in Table 12.2.

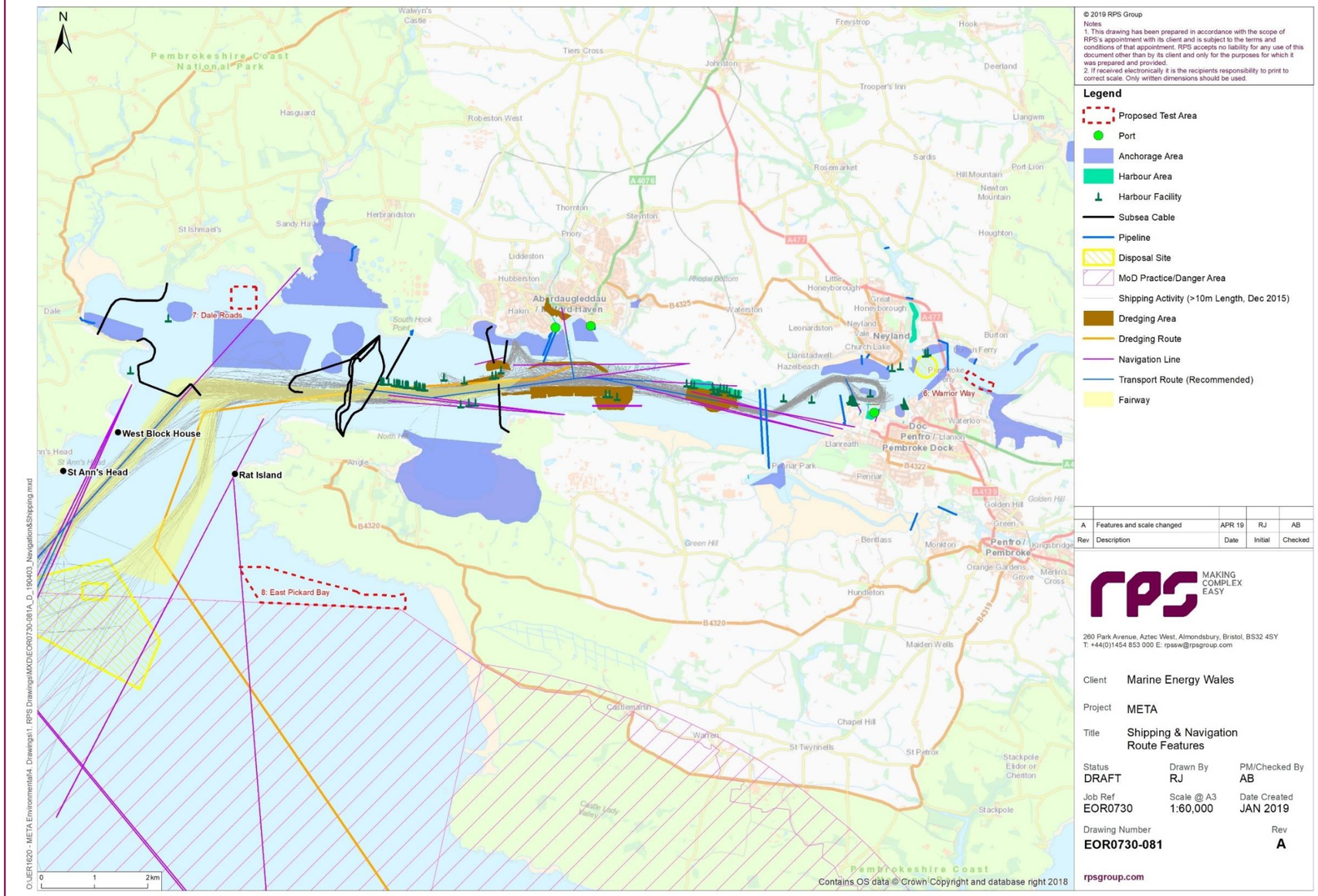

Figure 12.1: Shipping and Navigation Study Area.

Table 12.1: Summary of policy framework provisions relevant to Shipping and Navigation.

Summary of relevant policy framework	How and where considered in the Environmental Statement
Navigation and Shipping	
Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase and this should continue throughout the life of the development (paragraph 2.6.153 of NPS EN-3).	Consultation has been undertaken with stakeholders and regular operators. This includes carrying out a stakeholder workshop for navigational issues. Further information is presented in section 12.5).
Assessment should be underpinned by consultation with the Marine Management Organisation (MMO), Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority, the relevant industry bodies and any representatives of recreational users of the sea (paragraph 2.6.154 of NPS EN-3).	Consultation has been carried out with Natural Resources Wales (NRW), MCA, Trinity House Lighthouse Service (THLS), and other relevant users of the Waterway as described in section 12.5.
Information on internationally recognised sea lanes should be considered prior to undertaking assessments (paragraph 2.6.155 of NPS EN-3).	Automatic Identification System (AIS) data and other publicly available data has been used to make an assessment of shipping routes, including regular operators, within the Shipping and Navigation Study Area (see section 12.6.1).
Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant Government guidance (paragraph 2.6.156 of NPS EN-3).	An NRA has been undertaken in line with relevant guidance and is included in Appendix 12.1: Navigational Risk Assessment.
Where there is a possibility that safety zones will be sought, potential effects should be included in the assessment (paragraph 2.6.158 of NPS EN-3).	The potential presence of safety zones has been considered in section 12.8 and in the assessment in section 12.11.
The potential effect on recreational craft, such as yachts, should be considered (paragraph 2.6.160 of NPS EN-3).	AIS data and other publicly available data sources, together with information provided through consultation with recreational users of the Waterway, have been used to inform the assessment presented in section 12.11.

Table 12.2: Summary of NPS EN-3 policy on decision making relevant to Shipping and Navigation.

Summary of relevant policy framework	How and where considered in the Environmental Statement
Navigation and Shipping	
Consent should not be granted if the development would cause interference with use of recognised sea lanes essential to international navigation (paragraph 2.6.161 of NPS EN-3).	The META project will not interfere with recognised sea lanes essential to international navigation, as described in section 12.7.
Site selection should be made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to trade, lifeline ferries and recreational users of the sea (paragraph 2.6.162 of NPS EN-3).	Site Selection is described in Chapter 3: Need and Alternatives Considered. The META sites have been selected in consultation with the Milford Haven Port Authority (MHPA) to avoid the main shipping activities and navigational risks (see section 12.5).
The Applicant should minimise negative impacts to less strategically important shipping routes to as low as reasonably practicable (ALARP) (paragraph 2.6.163 of NPS EN-3).	The impacts of the META sites have been minimised to ALARP or lower as described in Appendix 12.1: Navigational Risk Assessment.
A Search and Rescue (SAR) Response Assessment should be undertaken prior to commencement of construction (paragraph 2.6.164 of NPS EN-3).	The META project will adhere to any requirements set out by regulators with regards to SAR, as described in Table 12.10.
Applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered should not be consented (paragraph 2.6.165 of NPS EN-3).	The impacts of the META sites have been minimised to ALARP or lower as described in Appendix 12.1: Navigational Risk Assessment.
The scheme must be designed to minimise the effects on recreational craft (paragraph 2.6.166 of NPS EN-3).	The impact on recreational craft is assessed in section 12.11 and designed-in measures are presented in Table 12.10.
The extent and nature of any obstruction of or danger to navigation which is likely to be caused by the development will be considered (paragraph 2.6.168 of NPS EN-3).	The impacts of the META sites have been minimised to ALARP or lower as described in Appendix 12.1: Navigational Risk Assessment.
Cumulative effects will be considered (paragraph 2.6.169 of NPS EN-3).	Cumulative effects have been considered in section 12.13.

12.5 Consultation

12.5.1.1 A summary of the key issues raised during consultation specific to Shipping and Navigation is outlined below, together with how these issues have been considered in the production of this Environmental Statement chapter. Table 12.3 summarises the issues raised relevant to Shipping and Navigation, which have been identified during consultation activities undertaken to date. Table 12.3 also indicates either how these issues have been addressed within this Environmental Statement or how the Applicant has had regard to them.

Table 12.3: Summary of key consultation issues raised during consultation activities undertaken for the META project relevant to Shipping and Navigation.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
5 November 2018	Royal National Lifeboat Institution (RNLI), meeting and subsequent email correspondence	Floating infrastructure may attract kayakers/surfers etc to the area of deployments at East Pickard Bay thereby increasing the risk of interactions with the devices/buoys.	The potential for interactions with the devices is considered in section 12.11 for recreational vessels/craft. MEW will implement an Operational Management Plan (including Emergency Response) which will include a requirement for device-specific risk assessments to be prepared in advance of each specific device deployment to ensure that any risks to leisure users are minimised to ALARP or lower. Notices to mariners will be issued on a specific device-deployment basis, and will be sent directly to an email list of registered interested parties to help ensure that as many interested parties as possible are aware of the presence of infrastructure and the need to avoid the area during the period of specific device deployments (see Table 12.10). The devices will be marked with navigational marker buoys and MEW will also consider the use of safety vessels/guard boats during short-term installation/decommissioning activities and during short-term deployments (subject to the results of the device-specific risk assessment and following discussion with the navigational authorities).
14 January 2019	Royal Yachting Association (RYA) Scoping Response	The RYA recognises that this is currently a scoping request and that impacts to recreational boating have been included. We consider that the location of sites impact on cruising routes should also be included, particularly as regards East Pickard Bay. The RYA would also expect to be consulted on the NRA and other statutory requirements when the project moves to the application process.	Potential impacts on cruising routes are considered within section 12.11 and within Appendix 12.1: Navigational Risk Assessment (NRA).
15 January 2019	UK Chamber of Shipping Scoping Response	The Chamber is satisfied that the scoping report is adequate in meeting the objectives of describing the proposal, being suitable to inform an assessment of potential environmental effects, identifying cumulative impacts and transboundary impacts. The Chamber supports that Navigation has been scoped into the report and would like to re stress the importance of engagement with the MCA, UKHO and Trinity House and using sources such as IMO routeing measures, Trinity House AIS Data, UKHO charts and aids to navigation. The Chamber also supports that the report has stated that buoys, other navigational features, Navigation Risk Assessment and Notices to Mariners will be used and that all measures will be taken to keep the risk of any obstruction/ obstacle to navigation and risk of collision as low as possible.	Consultation has been carried out with MCA and THLS as described in Table 12.3. Data sources are described in Table 12.4 and include AIS data, UKHO data, MHPA data and other publicly available mapping data. The NRA is presented within Appendix 12.1: Navigational Risk Assessment (NRA). Designed-in measures are presented within Table 12.10.
17 January 2019	Email from Maritime and Coastguard Agency (MCA) summarising Scoping Response to NRW/MMO	Impact of proposed devices on the safety of navigation. In particular, allision/contact, changes to vessel routing and reduction in navigable space (and any resulting increase in the frequency of encounters), any constraints placed on recreational, commercial and fishing vessels operating in or transiting the area and access to ports and harbours. The Environmental Statement should provide details on the following possible impacts on navigational issues for both commercial and recreational craft: • Collision Risk • Navigational Safety • Visual intrusion and noise • Risk Management and Emergency response • Marking and lighting of site and information to mariners • Effect on small craft navigational and communication equipment • The risk to drifting recreational craft in adverse weather or tidal conditions • The likely squeeze of small craft into the routes of larger commercial vessels An NRA will need to be submitted in accordance with MGN 543 (and MGN 372). The shipping and navigation study should include radar and manual observations in addition to AIS data to ensure vessels of less than 300 gt are captured and should be completed within 24 months prior to the Environmental Statement submission. Casualty information from the Marine Accident Investigation Branch (MAIB) and RNLI would also be good data sources. The mooring arrangements for any floating turbines should be carried out in accordance with the MCA and HSE Guidance 'Regulatory expectations on moorings for floating wind and marine devices', which also include Third Party Verification. The marking of offshore wave and tidal energy installations will be based on recommendations of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA). Consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCOP).	• Potential impacts on navigational issues for commercial and recreational vessels are considered within section 12.11 and Appendix 12.1: Navigational Risk Assessment (NRA). Cumulative impacts are considered within section 12.13. Visual intrusion is considered in chapter 14: Seascape, and underwater noise is considered in chapter 6: Underwater Noise. • Notices to mariners will be issued on a specific device-deployment basis, and will be sent directly to an email list of registered interested parties to help ensure that as many interested parties as possible are aware of the presence of infrastructure and the need to avoid the area during the period of specific device deployments (see Table 12.10). • Navigational marker buoys and/or other Aids to Navigation will be deployed on a device-specific basis, as directed by MHPA and/or MCA and THLS, to demarcate testing activities. MEW will liaise with MHPA and/or MCA and THLS to ensure areas and devices are appropriately marked for navigational safety (see Table 12.10). • The NRA is presented within Appendix 12.1: Navigational Risk Assessment (NRA). Due to the relatively small spatial extent of the META project sites and as these sites fall predominantly within the MHPA jurisdiction, consultation was carried out with MCA (see below) who confirmed that radar and visual observations were not required and that AIS data could be relied upon, providing wide consultation could be demonstrated. This is considered proportionate to the scale of the works. • An Operational Management Plan (including Emergency Response) will be developed and implemented for the installation and operation and maintenance phases of the META project, in consultation with the MHPA/MCA. To include for emergency shut down of devices in the event of an emergency situation. Other designed-in measures are set out in Table 12.10.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		Particular attention should be paid to cabling routes, and where appropriate, burial depth. If cable protection is required, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. The cumulative and in combination effects require consideration, in particular regarding shipping routes.	
18 January 2019	MCA Scoping Response in full	Our remit for offshore renewable energy development is to ensure that safety of navigation is preserved whilst progress is made towards government targets for renewable energy. We would expect the Environmental Statement to supply detail on the possible impact on navigational issues for both commercial and recreational craft, covering: • Collision Risk • Navigational Safety • Visual intrusion and noise • Risk Management and Emergency response • Marking and lighting of site and information to mariners • Effect on small craft navigational and communication equipment • The risk to drifting recreational craft in adverse weather or tidal conditions • The likely squeeze of small craft into the routes of larger commercial vessels. A Navigational Risk Assessment will need to be submitted in accordance with MGN 543 and the MCA Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations. The shipping and navigation study should include radar and manual observations in addition to AIS data to ensure vessels of less than 300gt are captured. MGN 543 requires that traffic studies should be completed within 24 months prior to the Environmental Statement submission or we would expect a new traffic study to be undertaken. The NRA needs to relate to a safe Under Keel Clearance (UKC), which should address the maximum drafts of vessel both observed and anticipated, from which a realistic UKC assessment should be undertaken. Further guidance is available on our website at the following link: https://www.gov.uk/guidance/offshore-renewable-energy-installations-impact-on-shipping Particular attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and, subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection are required e.g. rock bags, concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase. As this project progress, we would encourage the developers to keep MCA informed, and welcome early discussion on the points raised above. Any application for safety zones will need to be carefully assessed and additionally supported by experience from the development and construction stages. Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCoP). Attention should be paid to the level of radar surveillance, AIS and shore-based VHF radio coverage and give due consideration for appropriate mitigation. MGN 543 Annex 2 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager and the UK Hydrographic Office. Failure to report the survey or conduct it to Order 1a might invalidate the Navigational Risk Assessment if it was deemed not fit for purpose.	• Potential impacts on navigational issues for commercial and recreational vessels are considered within section 12.11 and Appendix 12.1: Navigational Risk Assessment (NRA). Visual intrusion is considered in chapter 14: Seascape, and underwater noise is considered in chapter 6: Underwater Noise. • Notices to mariners will be issued on a specific device-deployment basis, and will be sent directly to an email list of registered interested parties to help ensure that as many interested parties as possible are aware of the presence of infrastructure and the need to avoid the area during the period of specific device deployments (see Table 12.10). • Navigational marker buoys and/or other Aids to Navigation will be deployed on a device-specific basis, as directed by MHPA and/or MCA and THLS, to demarcate testing activities. MEW will liaise with MHPA and/or MCA and THLS to ensure areas and devices are appropriately marked for navigational safety (see Table 12.10). • The NRA is presented within Appendix 12.1: Navigational Risk Assessment (NRA). Due to the relatively small spatial extent of the META project sites and as these sites fall predominantly within the MHPA jurisdiction, consultation was carried out with MCA (see below) who confirmed that radar and visual observations were not required and that AIS data could be relied upon, providing wide consultation could be demonstrated. This is considered proportionate to the scale of the works. • This application does not include the installation of any communications or power cables. • The potential for Safety Zones is considered within Table 12.10. • An Operational Management Plan (including Emergency Response) will be developed and implemented for the installation and operation and maintenance phases of the META project, in consultation with the MHPA/MCA. To include for emergency shut down of devices in the event of an emergency situation. Other designed-in measures are set out in Table 12.10. • Given the location of the META test sites within the MHPA SHA area, MGN 543 has been used as a guide only and an approach has been adopted which is considered to be proportionate to the project. No hydrographic surveys are planned for this project and it is understood that good hydrographic data are available for the Waterway from the MHPA.
22 January 2019	Telecon with MCA	MCA confirmed that radar data / visual data will not be required to inform the NRA, providing that robust alternatives are demonstrated in the form of wide consultation.	The NRA is presented within Appendix 12.1: Navigational Risk Assessment (NRA). Consultation is presented within Table 12.3.
24 January 2019	Email from Irish Ferries	Effects on ferry schedule and services with the twice daily sailings from Pembroke Dock Ferry Terminal. Main issues: • Restricted access to Pembroke Dock Ferry Terminal. • The narrow Navigable Channel which the Ferry transits, and no other vessel movements permitted during her transit to the berth. • Increased activity around Pembroke Dock waterway, which could incur slow passing of berths, causing delays.	Potential impacts on passenger vessels are considered within section 12.11 and Appendix 12.1: Navigational Risk Assessment (NRA).

Date	Consultee and type of response		Issues raised	Response to issue raised and/or where considered in this chapter
			• Delays to ferry service due weather and the impact any activity would have with this project.	
24 January 2019	Email from THLS		Any existing aids to navigation in the META project areas should be maintained or fully risk assessed with the Harbour Authority before removal or relocation. This would then need to be consented by THLS. If any additional aids to navigation are considered, THLS will need to be consulted and can provide specific advice. THLS would stipulate any aids to navigation in their advice to NRW during the licencing process. META project areas will need some form of marking due to the recreational and other small vessels operating in the area. This would most probably be through a mix of lit/unlit cardinal and special marks. THLS will provide a firm direction following consultation with the Harbour Authority during the licencing process.	Navigational marker buoys and/or other Aids to Navigation will be deployed on a device-specific basis, as directed by MHPA and/or MCA and THLS, to demarcate testing activities. MEW will liaise with MHPA and/or MCA and THLS to ensure areas and devices are appropriately marked for navigational safety (see Table 12.10).
30 January 2019	Stakeholder Workshop	(Navigation)	Warrior Way (site 6) • There is an activity centre at Warrior Way (site 6) – the Pembrokeshire Performance Sailing Academy (PPSA) – offering dinghy sailing, power boat and shore-based courses, meaning there will be a lot of small vessel activity in proximity to Warrior Way (site 6). • Yacht racing occurs at Neyland, and Pembroke Yacht Club at Hobbs Point – Wednesday nights and Sunday. Start line uses entire width of the Waterway at Hobbs Point [these races go downstream from the start line which is in line with Neyland marina entrance] • Cruiser racing predominately occurs in daylight hours, 12-20 boats maximum, of 29-35 foot • Kids jumping/swimming at Hobbs Point Jetty [unofficially] • Concern that activities at Warrior Way may cause vessels to be pushed towards the shallows on the opposite side of the Waterway • Small craft training occurs at Warrior Way (site 6), and several children may use the slipway at any one time during the Spring/Summer. A dedicated safety boat recovers people (including children) from the water following practice capsize events. Concern that unattended small craft could drift into the Warrior Way area with the tidal flow • Some potting occurs within the Warrior Way area. Line fishing also occurs (predominantly recreational) • Potential conflicts are not insurmountable with careful planning and management	Existing vessel traffic in the vicinity of the Warrior Way (site 6) site is identified in section 12.7 from review of available data and as advised through consultation. Potential impacts on navigational issues for commercial and recreational vessels are assessed in section 12.11.
30 January 2019	Stakeholder Workshop	(Navigation)	Dale Road (site 7) • Water sports occur at a lower level compared with Warrior Way (site 6). Diving occurs on the wrecks to the south of Great Castle Head. Occasional power boat training. Swimming is generally discouraged in the Waterway, and restricted to sheltered bays (e.g. Dale Bay, Sandy Haven) • Some potting for whelks occurs in the vicinity of Dale Roads (site 7), and there are lots of unmarked fishing buoys. 5/6 fisherman were understood to use the Dale area commercially, with the rocky reef habitats favoured (noting that these rocky reef areas have been excluded from the META sites), and a few take out recreational fisherman. 3-4-line fisherman operate from Dale Roads • Potential risk from breakout of META devices and associated drifting/sinking. Also potential risk of third party vessel breakout impacting a META device in this area • Small tankers anchor to the western end of the Dale Bay. There are similar, but more dispersed, vessel traffic levels as Warrior Way	Existing vessel traffic in the vicinity of the Dale Roads (site 7) site is identified in section 12.7 from review of available data and as advised through consultation. Potential impacts on navigational issues for commercial and recreational vessels are assessed in section 12.11.
30 January 2019	Stakeholder Workshop	(Navigation)	East Pickard Bay (site 8) • Commercial vessels and cruise ships are unlikely to use the site • Potting occurs along the coast, but the site is at the edge of the 10 m depth contour • Most traffic would likely be lobster fisherman, or the Navy transiting through the site to their training areas • Kayaking is sporadic, however there is potential for surfers to actively investigate the devices	Existing vessel traffic in the vicinity of the East Pickard Bay (site 8) site is identified in section 12.7 from review of available data and as advised through consultation. Potential impacts on navigational issues for commercial and recreational vessels are assessed in section 12.11.
30 January 2019	Stakeholder Workshop	(Navigation)	Other general points raised: • The MHPA regularly patrol the waters May-September • Potential for reduced underkeel clearance	Potential for reduced underkeel clearance is considered within section 12.11. Existing port traffic management measures are outlined within section 12.7.3.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		• It was noted that there is good management and relationships between recreational users and the port authority, with a designated officer. Activities are generally away from the Port and there is well-established interaction	
22 February 2019	Email from Pembrokeshire Performance Sailing Academy (PPSA)	Key points in relation to Warrior Way (site 6): • AIS and RYA data sources are unreliable for the area • Many members of the public use the slipway seasonally at Warrior Way/Cleddau Reach to launch/recover craft (sailing dinghies, powerboats/sportboats, water ski/wakeboard users and Personal Watercraft). In addition, PPSA, Llanion Cove and other paddlesports and multi-activity users use the slipway throughout the year • The site boundaries encompass the slipway area and would compress access to the river east of the Cleddau Bridge. Request that if possible the boundaries be revised • Request consultation regarding scheduling of activities before a Notice to Mariners is published, due to the need to accommodate advance bookings • The area is used to train novice sailors and powerboat users. There may be times when boats drift into the META test area. The proposed site is also within the area used for introducing planned speed manoeuvres on powerboat courses	• Recreational activities in the vicinity of the Warrior Way (site 6) site have been identified in section 12.7 from review of available data and as advised through consultation. Potential impacts on recreational receptors are assessed in section 12.11. • The site boundaries have been revised and no longer encompass the slipway.

12.6 Methodology to inform the baseline

12.6.1 Desktop study

12.6.1.1 Information on Shipping and Navigation within the Shipping and Navigation study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 12.4 below and further information can also be found in Appendix 12.1: Navigational Risk Assessment (NRA).

Table 12.4: Summary of key desktop datasets.

Title	Source	Year	Author
AIS data	Marine Traffic	2018	Marine Traffic
MHPA commercial traffic data	MHPA	2014-2019	-
RYA leisure user intensity mapping	Wales Marine Planning Portal	2016	Welsh Government
MHPA incident datasets	MHPA	2013-2018	MHPA
MAIB incident datasets	MAIB	1997 - 2017	MAIB
UKHO Publication NP37 – Admiralty Sailing Directions – West Coasts of England and Wales Pilot	UKHO	2014	UKHO
Ports	World Ports Database	2018	EMODnet
Anchorage Areas	The Crown Estate	2018	The Crown Estate
Harbour Areas	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Harbour Facilities	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Subsea Cables	Kis-Orca	2018	Kis-Orca
Navigation Lines	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Transport Route (Recommended)	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Fairways	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Pipelines	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Dredging Routes	British Marine Aggregate Producers Association (BMAPA)	2018	British Marine Aggregate Producers Association (BMAPA)
Dredging Areas	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
Disposal Sites	Oceanwise Marine Themes GIS Data	2018	Oceanwise / Hydrographic Office
MoD Practice/Danger Areas	MoD	2018	MoD
Shipping Activity	MMO (AIS)	2015	MMO (AIS)

12.6.1.2 MCA's MGN 543 requires that "An up to date, traffic survey of the area concerned should be undertaken within 12 months prior to submission of the Environmental Statement. This should include all the vessel types found in the area and total at least 28 days duration but should also take account of seasonal variations in traffic patterns and fishing operations. (Note: AIS data alone will not constitute an appropriate traffic survey).

12.6.1.3 Therefore, the NRA should be based on the best available data that accounts for all marine users, not just those equipped with AIS. Typically, this is achieved through a radar and visual traffic survey. This approach is not considered proportional for the META project, given the scale and location of the test sites within or in close proximity to the MHPA Statutory Harbour Authority (SHA) area.

12.6.1.4 Following advice from the MCA (see Table 12.3) it has been considered sufficient to obtain and analyse suitable AIS data and support the analysis of that data with wide stakeholder consultation to establish the status of non-AIS equipped traffic.

12.6.1.5 Recent AIS data was obtained for the whole Waterway covering the following winter and summer periods:

- 01 to 28 February 2018; and
- 01 to 28 August 2018.

12.6.1.6 Recognising that AIS data cannot capture all vessel movements, and in order to verify AIS data sets, additional data regarding commercial vessel traffic was obtained from MHPA covering a five-year period (2014-2019) (including the periods covered by AIS data).

12.6.1.7 A stakeholder workshop was held in January 2019 with a number of key navigation stakeholders including MHPA and other commercial and recreational operators within the Waterway, to gain local knowledge and insight on navigation. A description of the consultation carried out is presented in section 12.5.

12.6.2 Site specific surveys

12.6.2.1 No site-specific surveys have been undertaken to inform the EIA for Shipping and Navigation. This is because the baseline characterisation developed through existing data sources and consultation is considered sufficient to inform the Shipping and Navigation chapter.

12.7 Baseline environment

12.7.1 Overview

12.7.1.1 The following sections provide a description of the baseline environment. Further information can be found in Appendix 12.1: Navigational Risk Assessment (NRA).

12.7.2 Navigational Features

12.7.2.1 The META test sites are situated within or close to the entrance of the Waterway. 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 Port currently serves Valero Refinery and Valero Pembrokeshire Oil Terminal, Puma Energy, South Hook LNG and Dragon LNG. Cargoes are received from the North Sea, North and West Africa, the Middle East, Asia, and Europe, and processed materials are transported domestically and internationally. 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.

12.7.2.2 There is a lighthouse at St Ann's Head at the entrance to the Waterway, and commercial navigational lights, markers and buoys along the approaches.

12.7.2.3 No formal (i.e. designated) anchorage areas exist in any of the META project sites. A regularly used designated anchorage managed by MHPA is located approximately 0.5 NM south of the Dale Roads site (site 7). The anchorage areas presented in Figure 12.1 are indicative areas which include sheltered bays and inlets and do not represent the designated anchorages, although the designated anchorage to the south of Dale Roads is included within the area shown. There are no restrictions on anchoring in any of the META project sites, and none are likely to be used by commercial vessels, but leisure vessels may choose to anchor in the shallower waters of Warrior Way (site 6) and Dale Roads (site 7) (see Figure 12.1). It is considered unlikely that any vessel would choose to anchor in East Pickard Bay (site 8), except in an emergency.

12.7.2.4 MHPA carries out maintenance dredging in several areas of the Waterway, predominantly in the main deep-water channel and approaches to the main hydrocarbon jetties. There are also two licensed disposal sites in the Waterway and adjacent waters, the principal site being outside the entrance of the Waterway (Milford Haven/St Ann's Head), while a small area also exists closer to Pembroke Dock towards the Cleddau Bridge (see Figure 12.1).

12.7.2.5 There are no existing marine renewable energy installations within the META test areas or wider Waterway. There are numerous subsea cables and pipelines within the Waterway. The nearest subsea cables/pipelines to the Warrior Way (site 6) site are located approximately 157m to the north and 321 m to the west of the site. There are no subsea cables or pipelines charted in the immediate vicinity of the Dale Roads (site 7) site or East Pickard Bay (site 8) site.

12.7.2.6 There are no military exercise areas within the Waterway. The Castlemartin Military Practice Area D113A is located immediately south of the entrance to the Waterway and extends for up to 12 NM from the coast between Little Furznip (at the southern extent of Freshwater West Bay) and St Govan's Head (Milford Haven Port Authority, 2019). While the range is active, it is actively managed and protected by a range safety vessel.

12.7.3 Vessel Traffic Management

12.7.3.1 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 (SHA) and Competent Harbour Authority (CHA) areas which are managed by MHPA. MHPA provides a Vessel Traffic Service (VTS) which actively monitors the Waterway below the Cleddau Bridge. East Pickard Bay (site 8) is largely out with the SHA area, and therefore MHPA has no statutory duty or powers to direct traffic within the majority of this area. However, the site is very close to the approaches to the Waterway, and all commercial traffic passing close by, or through the proposed site, is likely to be bound to or from the port and therefore subject to pilotage and other port control measures, such as passage planning requirements. Existing risk control measures within the SHA area include the following:

- Traffic management procedures (VTS/berth allocation);
- Lighting and marking of obstructions (Aids to Navigation (AtoN));
- Charting of sites and obstructions;
- Competence and training of marine personnel;
- Operational procedures;
- Regulations (e.g. Collision Regulations, local byelaws);
- Pilotage;
- Dredging and surveying of the harbour and approaches;
- Waterway management with identified zones for different activities; and
- Dissemination of information via Notices to Mariners, Website, Year book etc.

12.7.4 Metocean Conditions

12.7.4.1 The Waterway provides deep water berths and most vessels have 24-hour tidal access. The Waterway experiences prevailing south-westerly winds, though winds from the north west and south east are not uncommon, with south-easterly winds being more common in the mornings from March to June inclusive (see Appendix 12.1: Navigational Risk Assessment (NRA).

12.7.4.2 The Waterway is very sheltered, especially from the prevailing south-westerly winds. However, the Dale Roads (site 7) site is exposed to swells and wind from the south, and the East Pickard Bay (site 8) site, lying outside the headlands, is very exposed to the prevailing south-westerly weather conditions.

12.7.5 Existing Vessel Traffic

12.7.5.1 Figure 12.2 and Figure 12.3 present an overview of AIS reported vessel traffic within the Waterway during the summer and winter of 2018 respectively.

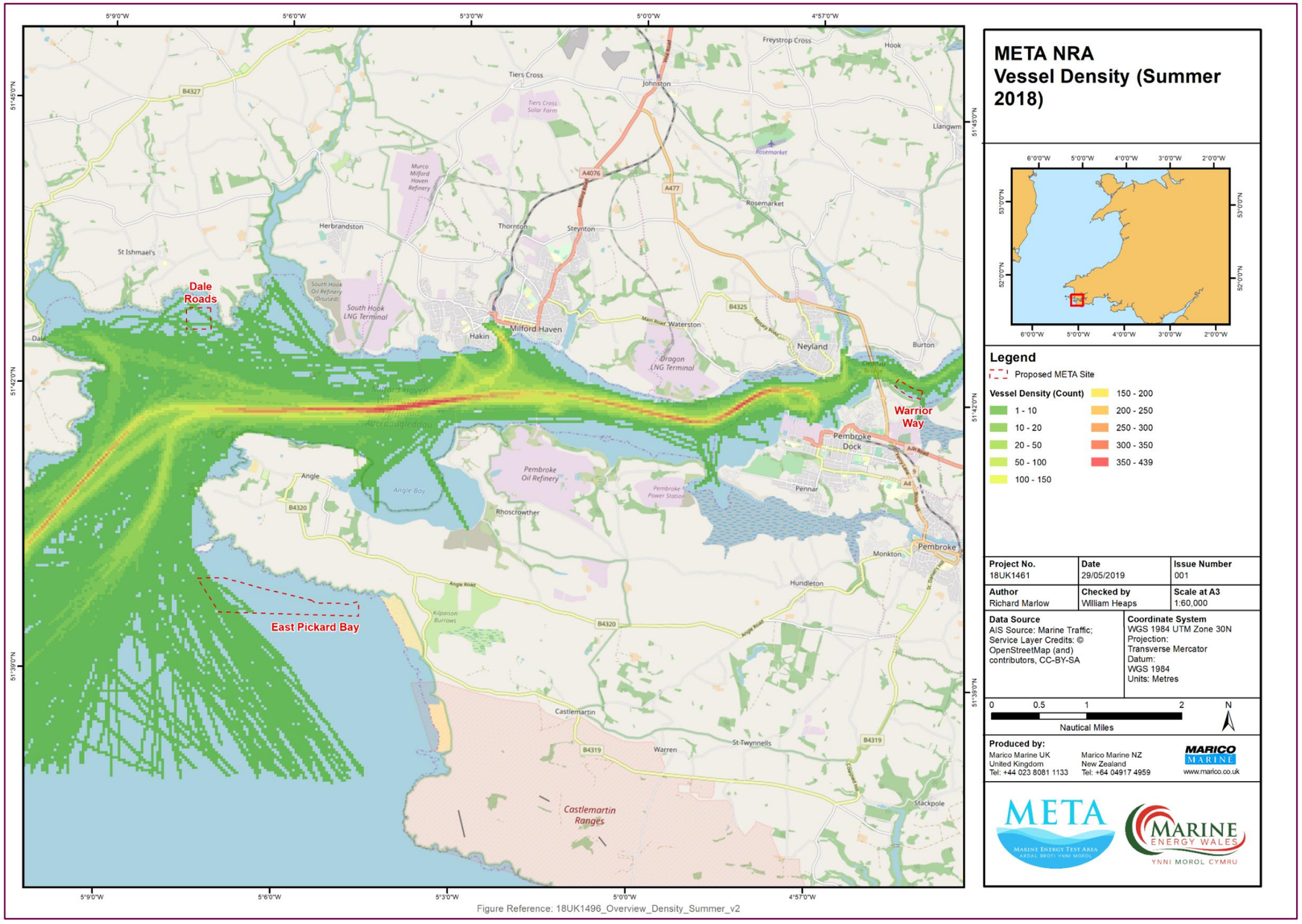

Figure 12.2: AIS reported vessel traffic density within the Waterway (summer 2018).

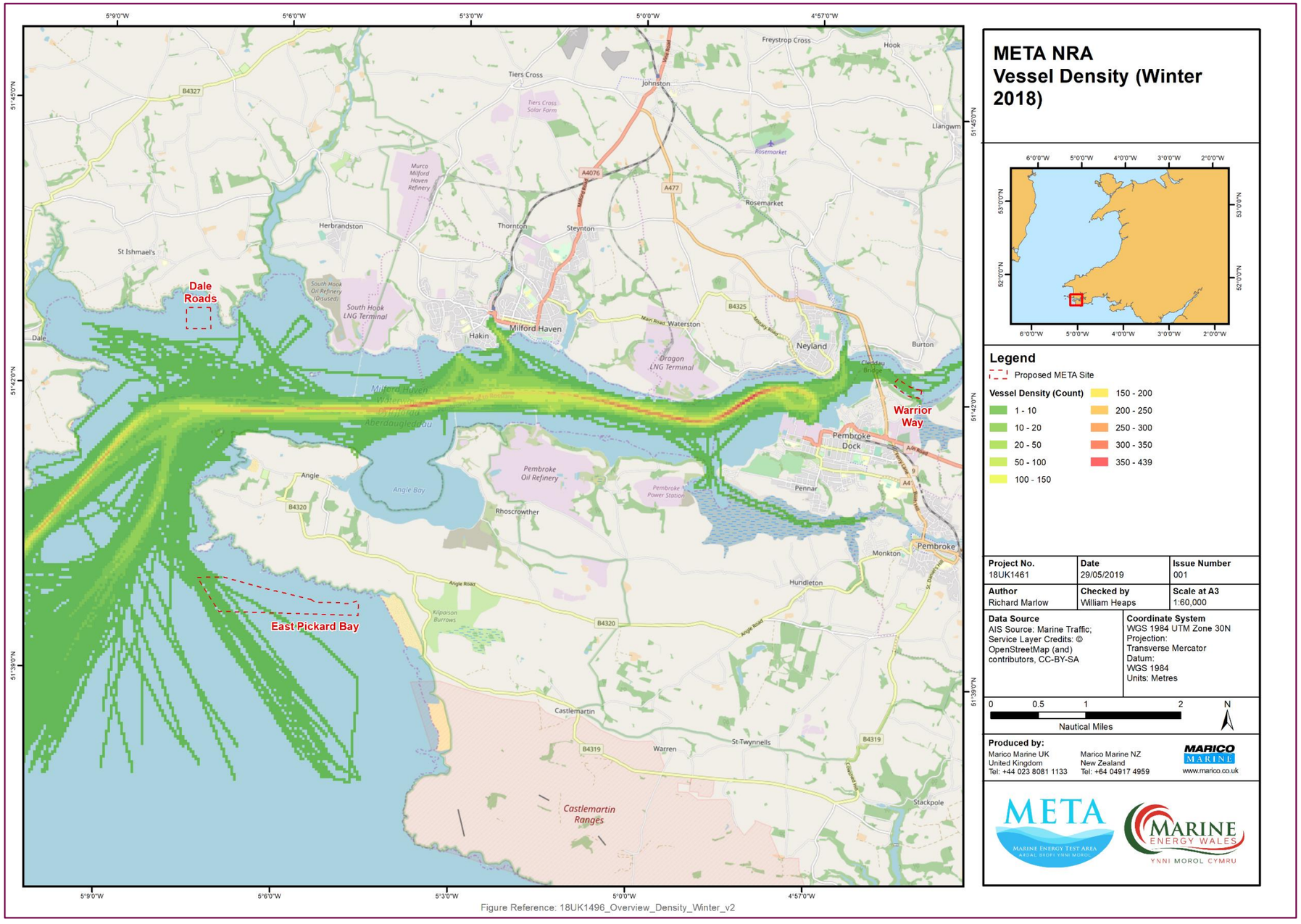

Figure 12.3: AIS reported vessel traffic density within the Waterway (winter).

12.7.5.2 The intensity of traffic bound for the main commercial berths is consistent in both summer and winter, with the routes to the main hydrocarbon berths (South Hook LNG, Valero refinery on the south bank, and Valero Oil Terminal & Dragon LNG), Milford Haven Dock and Pembroke Dock being clearly visible.

12.7.5.3 Much more of the Waterway (i.e. in terms of area) is used in the summer by those vessels transmitting AIS data than is the case during the winter, particularly the margins of the Waterway including the approaches to Dale and the reaches above the Cleddau Bridge.

12.7.5.4 Consultation has advised that leisure traffic is very seasonal in nature (predominantly summer months) while commercial traffic is relatively consistent throughout the year, although traffic associated with the LNG terminals can vary in frequency from one year to the next depending on global market conditions.

12.7.5.5 The following sections summarise the existing vessel traffic by vessel category (i.e. commercial, passenger, fishing, recreational, high-speed craft, and tugs and other vessels), based on analysis of the AIS data as supplemented by consultation advice where appropriate. Further information can be found in Appendix 12.1: Navigational Risk Assessment (NRA), including AIS vessel track plots for each vessel type at each site (summer and winter). A selection of plots are provided in this section.

Commercial Vessel Activity

12.7.5.6 Commercial vessels include tankers and cargo vessels. These vessels were recorded on clear in and out bound routes passing some distance to the south of Dale Roads (site 7) (see Figure 12.4) and to the west of East Pickard Bay (site 8) (see Figure 12.5), with no evidence of interaction with either of these sites. Some smaller vessels were recorded using the anchorage to the south of Dale Roads (site 7). No commercial vessel transits were recorded above the Cleddau Bridge and therefore no vessels were recorded in the vicinity of the Warrior Way (site 6) site.

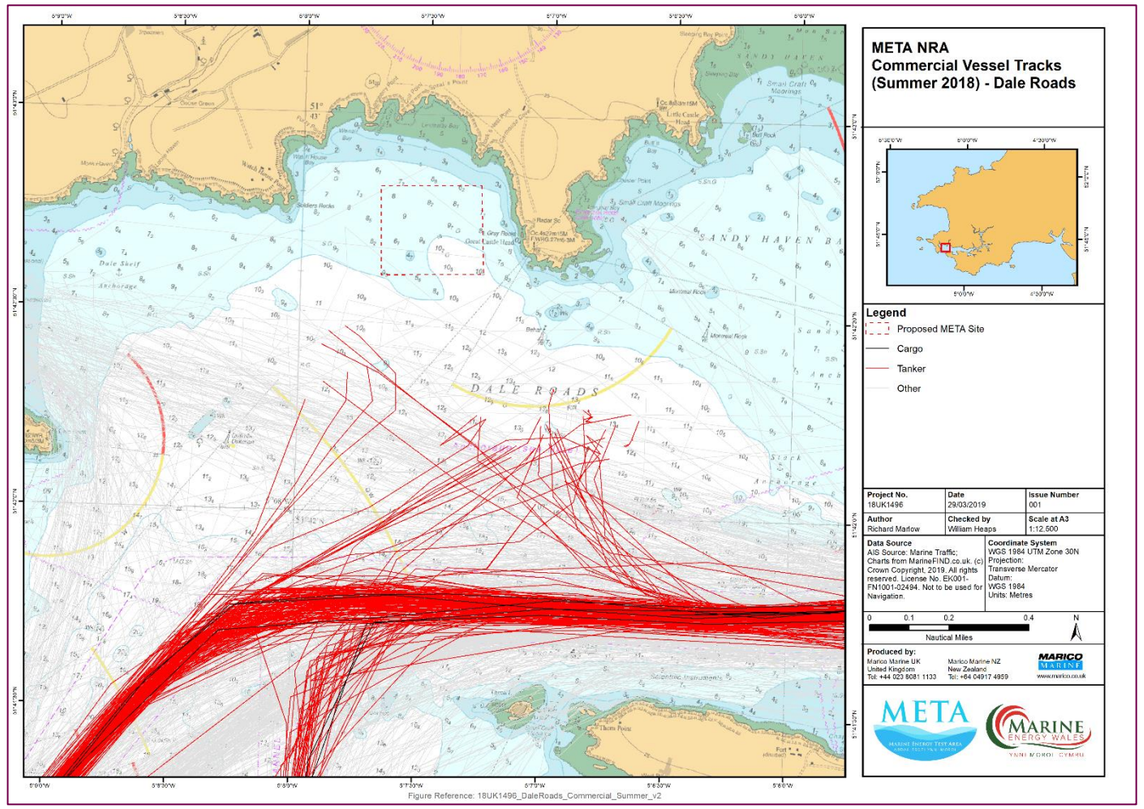

Figure 12.4: Commercial Vessel Transits: Dale Roads (summer).

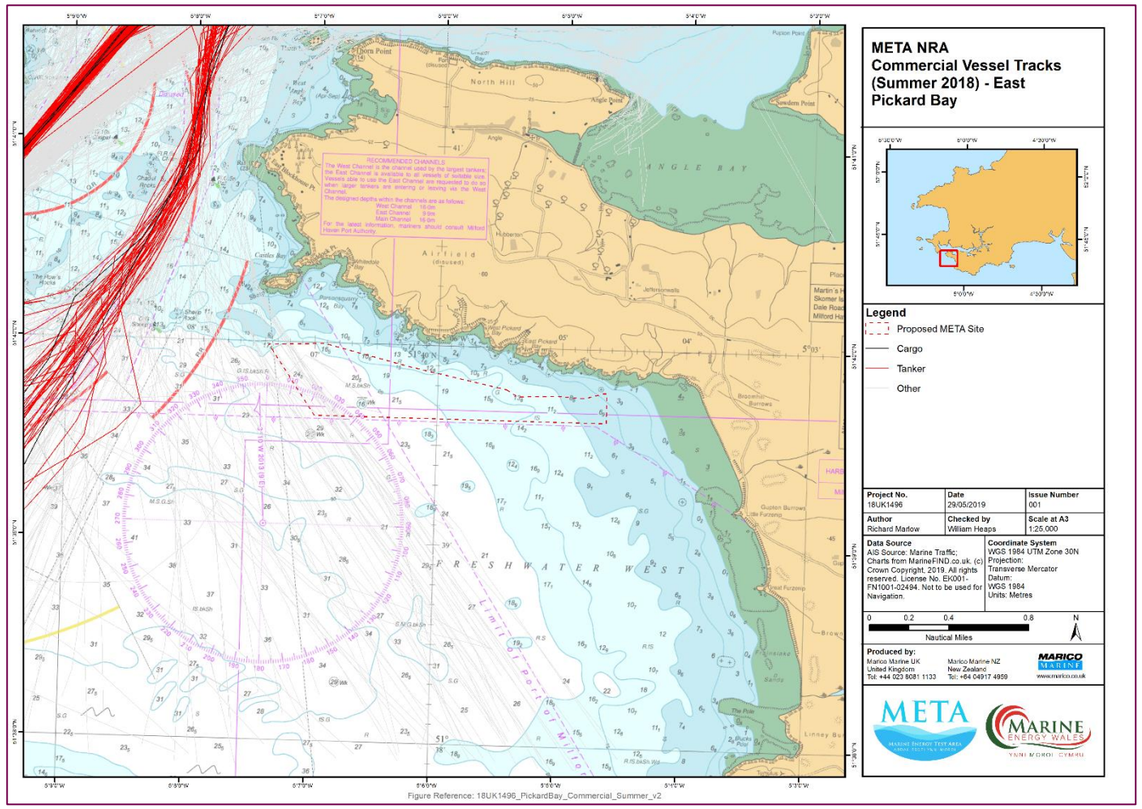

Figure 12.5: Commercial Vessel Transits: East Pickard Bay (summer).

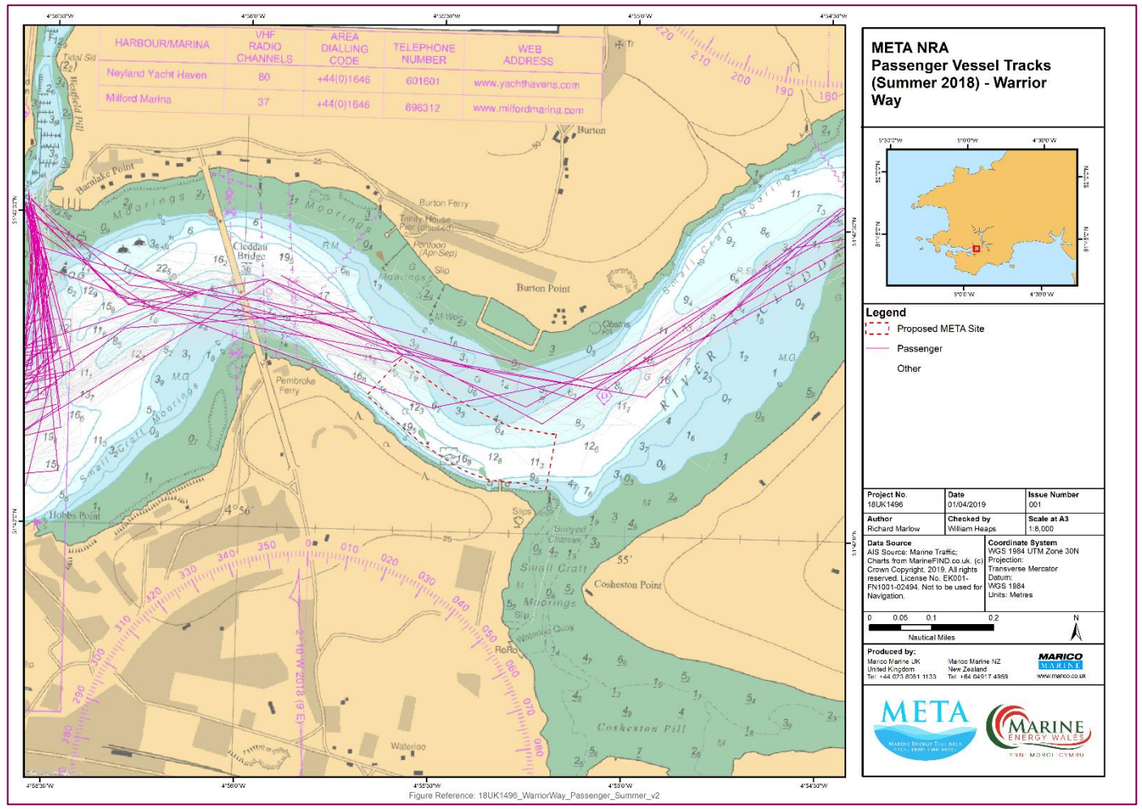

Figure 12.6: Passenger Vessel Transits: Warrior Way (summer).

Passenger Vessel Activity

12.7.5.7 The majority of passenger ferry tracks recorded to the south of Dale Roads (site 7) and to the west of East Pickard Bay (site 8) are represented by the Irish Sea ferry, which routinely makes two departures/arrivals per day from Pembroke Dock (see Figure 12.7 and Figure 12.8). Other passenger ferry tracks (likely to include seasonal sight-seeing trips) were recorded in the vicinity of all three sites, notably during the summer, however few tracks were recorded passing through the test site areas (see Figure 12.6, Figure 12.7 and Figure 12.8).

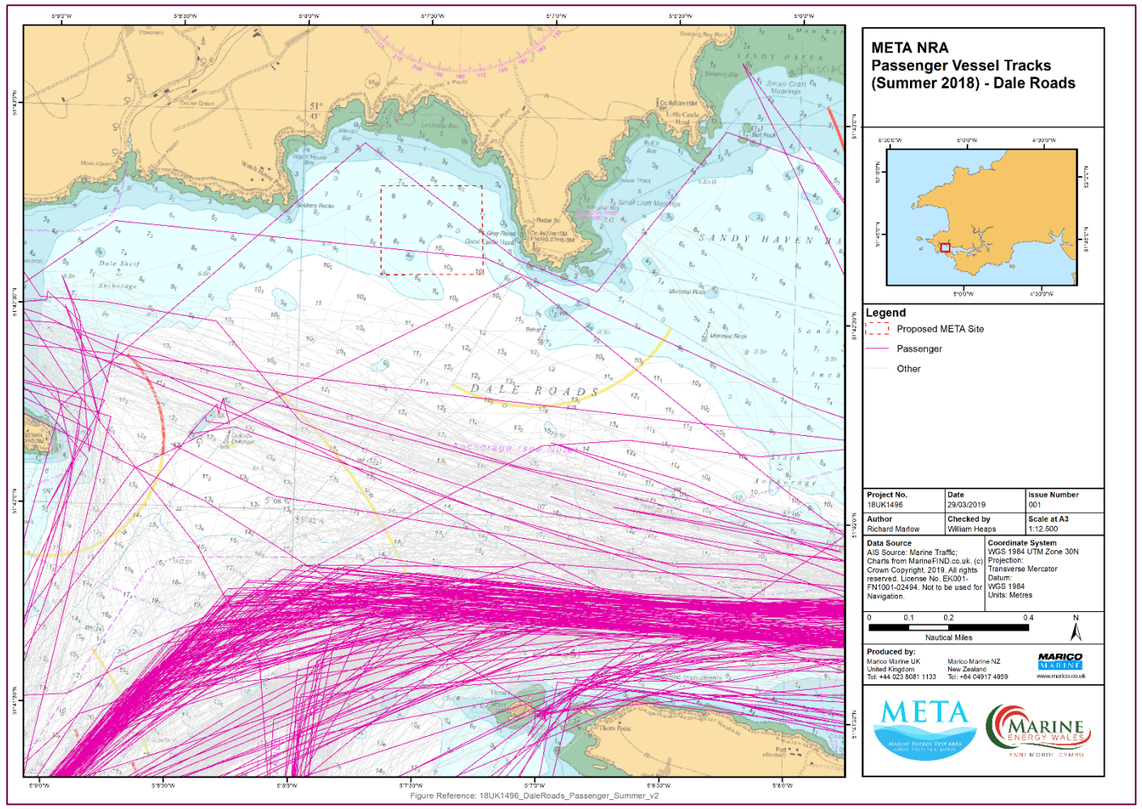

Figure 12.7: Passenger Vessel Transits: Dale Roads (summer).

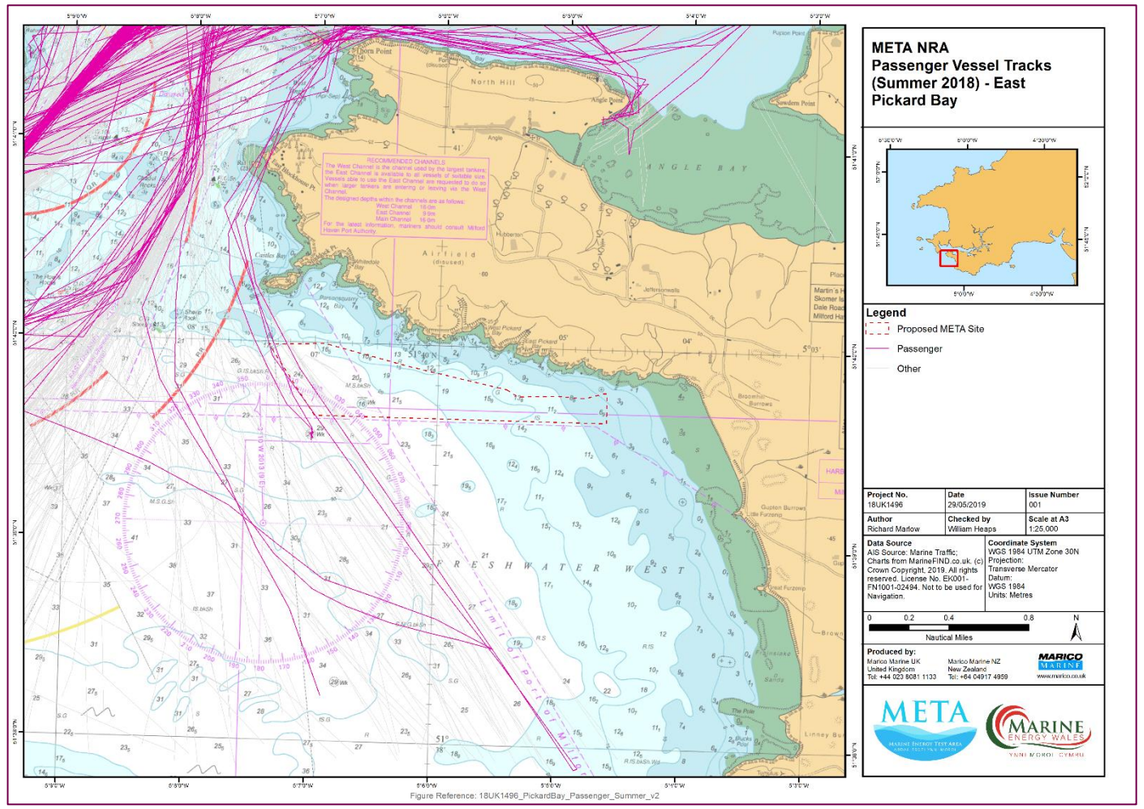

Figure 12.8: Passenger Vessel Transits: East Pickard Bay (summer).

Fishing Vessel Activity

12.7.5.8 Few fishing vessel tracks were recorded within or in the vicinity of the three test site areas. Tracks were mainly recorded passing from Milford Haven Docks to sea, with no evidence of active fishing (see Figure 12.9, Figure 12.10 and Figure 12.11). This aligns with feedback from stakeholder consultation, although there may be some small-scale inshore fishing to the north of the East Pickard Bay site (site 8), and potting may take place in all three test site areas.

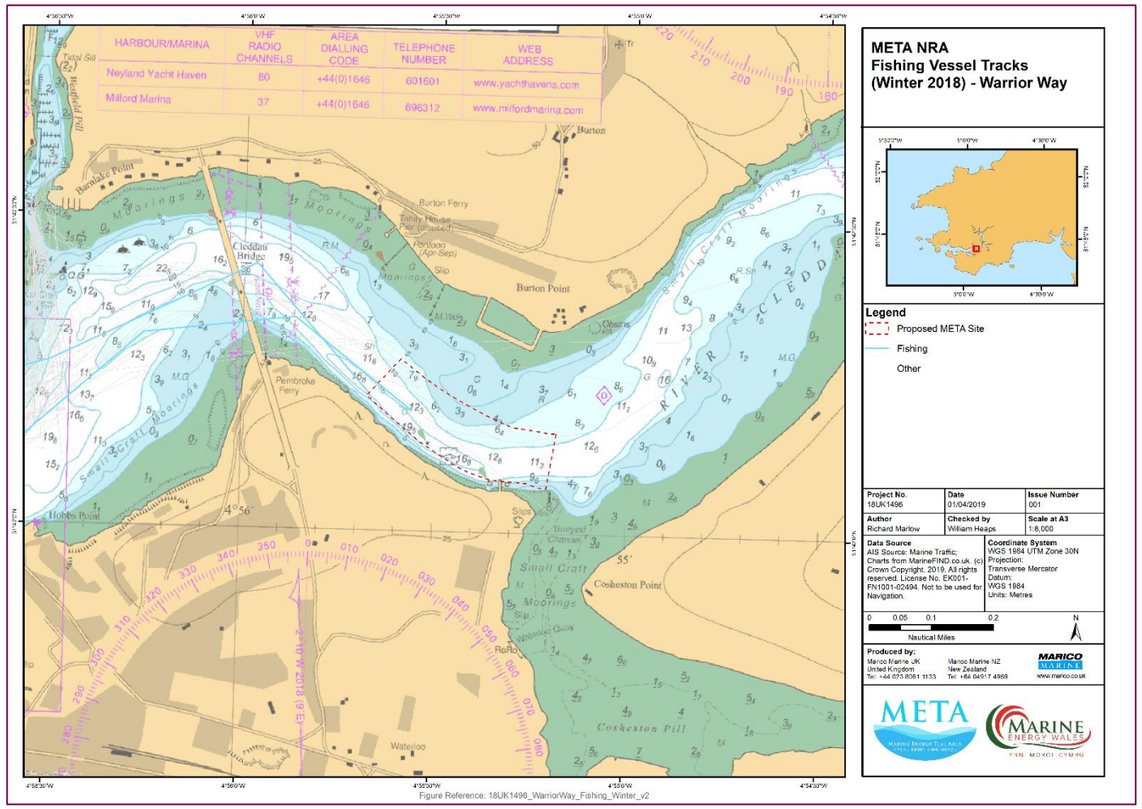

Figure 12.9: Fishing Vessel Transits: Warrior Way (winter).

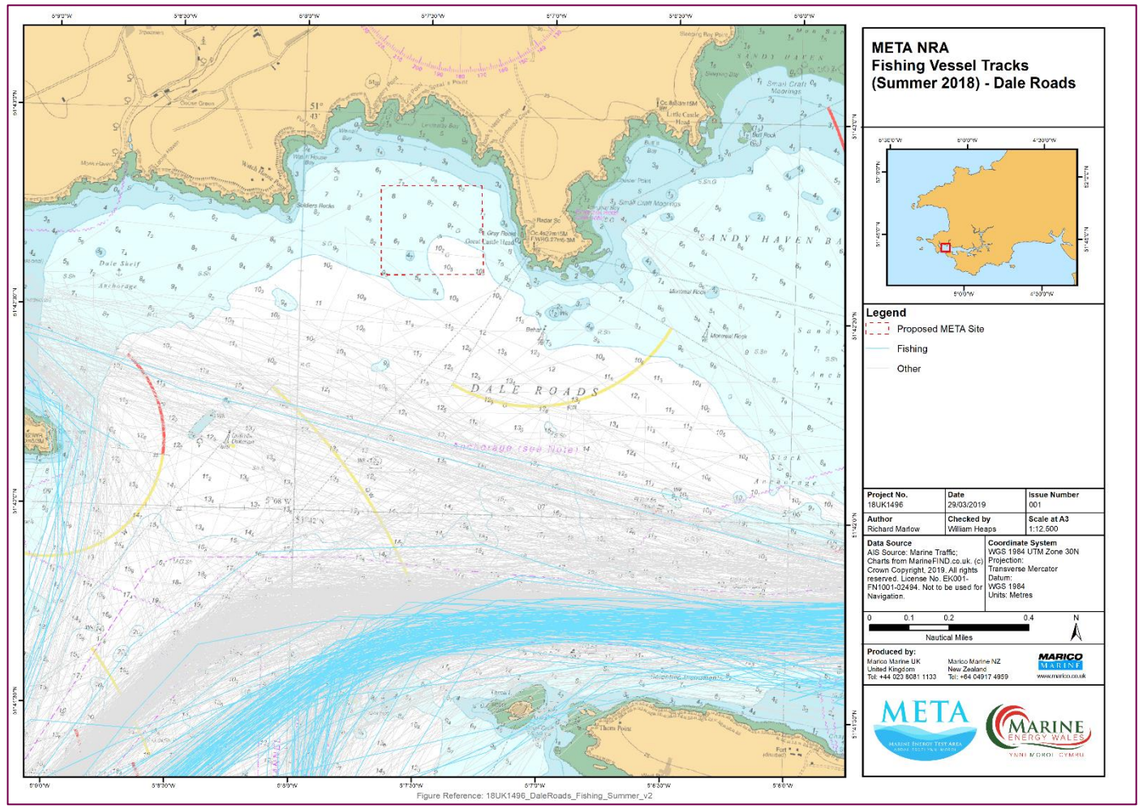

Figure 12.10: Fishing Vessel Transits: Dale Roads (summer).

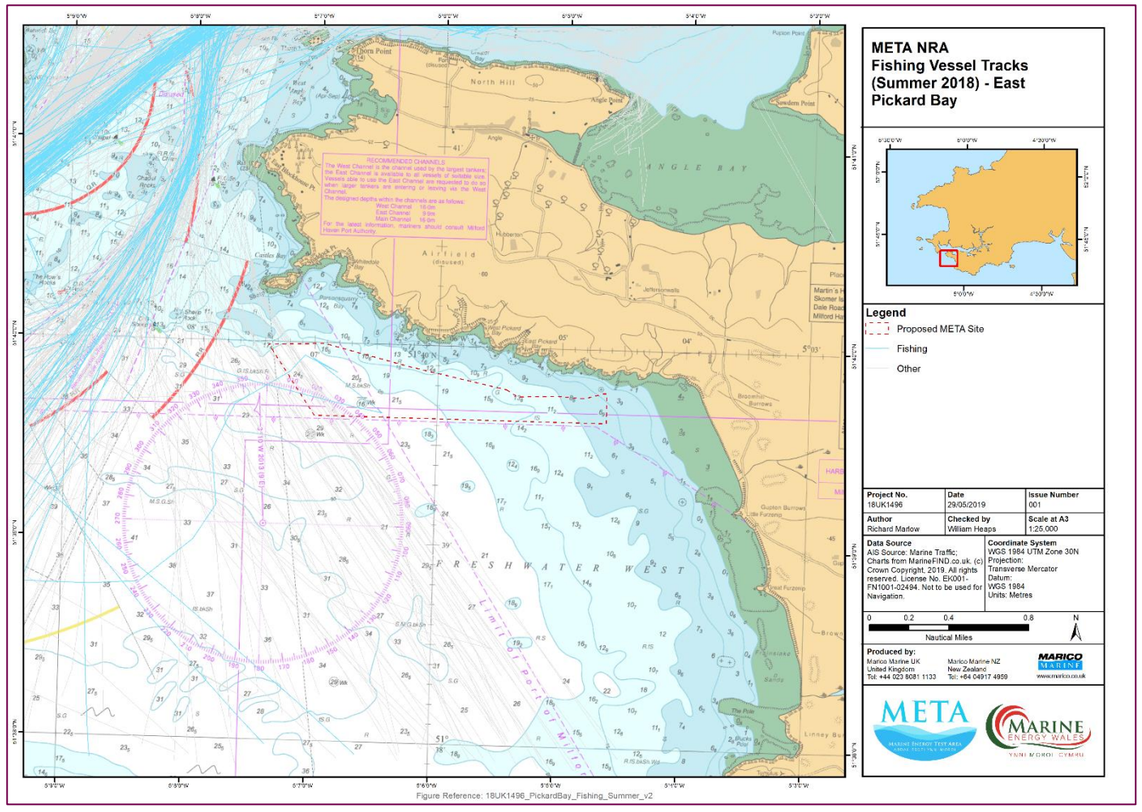

Figure 12.11: Fishing Vessel Transits: East Pickard Bay (summer).

12.7.5.9 Chapter 11: Commercial Fisheries also describes the commercial fisheries baseline for the Waterway. In summary, for Warrior Way (site 6), consultation has advised that there is very little/no commercial fishing vessel activity within the site due to strong tidal activity. For Dale Roads (site 7), consultation has indicated a high volume of coastal fishing activity (mostly potting) in the vicinity of the site and that fishing activity is common at Soldier's Rocks on the western side of Lindsway Bay. Indicative fishing grounds that overlap with Dale Roads (site 7) include light otter trawling and beach set nets, with a potting site also located in close proximity to the site. Overall, very few vessels may use the area for fishing grounds. For East Pickard Bay (site 8), consultation has indicated high shellfish potting activity and some fixed netting along the East Pickard Bay/Angle Peninsula coastline, with pots predominantly set on the rocky outcrops and reefs. Indicative fishing grounds that overlap with the site include light otter trawling, set nets and potting. Overall, fishing vessel activity at this site is considered small in the context of the wider area.

Recreational Vessel Activity

12.7.5.10 The Waterway is an important and well used area for water-based leisure activities, including sailing and motorboat cruising. There are also a wide variety of other activities including paddle sports, sail training, swimming, diving and coasteering. Overall these are well regulated by MHPA in conjunction with the Pembrokeshire Coast National Park Authority (PCNPA), and compliance with rules and regulations is enforced through the year-round presence of the MHPA water ranger (particularly during the summer). Leisure and other uses of the waterway are zoned, and clear information is given in the annual Tide Tables & Leisure User Guide. East Pickard Bay (site 8) is outside this zoning scheme, but stakeholder consultation has confirmed that this site is much less intensively used by leisure vessels than the sites within the Waterway.

12.7.5.11 Although most leisure vessels in the Waterway are unlikely to transmit AIS data, numerous tracks were recorded in the summer, likely to be larger vessels, mainly transiting between Neyland and the seaward end of the Waterway. There is also intensive usage of the Waterway by local vessels not recorded by AIS, including dinghy and small yacht cruising, racing (especially in the area near Hobbs Point), (youth) sail training, canoeing, and other paddle sports and associated support vessels. The AIS data has been combined with consultation feedback to examine the baseline environment for each site below.

12.7.5.12 Consultation has advised that Warrior Way (site 6) is the most intensively used of the three sites for leisure navigation. In particular, the area is frequently used for youth sail training and other water-based activities (including coasteering). Many leisure navigators in small craft access the area from the slipways at Llanion cove at the south-east of the site. Recreational vessel tracks in the summer were mainly recorded passing to the north of the site boundary, with few tracks recorded within the site, with the exception of the northern corner (see Figure 12.12). There were no recorded tracks in the winter period at this site.

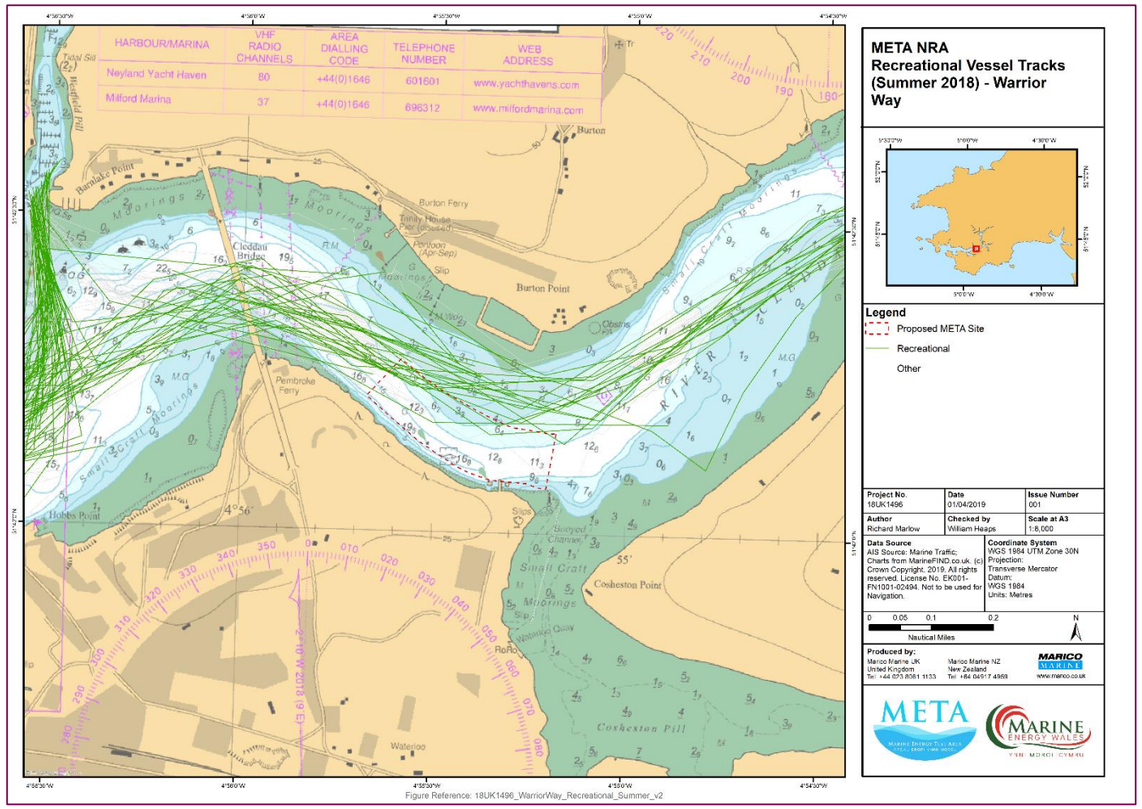

Figure 12.12: Recreational Vessel Transits: Warrior Way (summer).

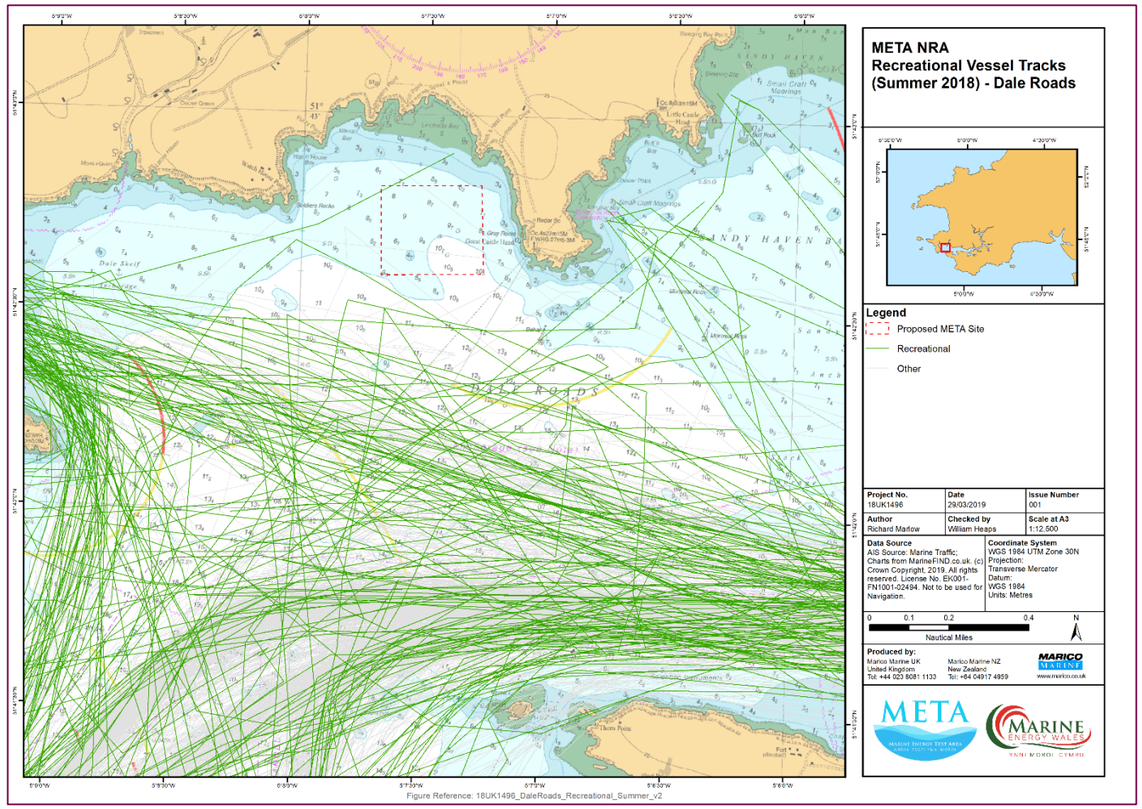

Figure 12.13: Recreational Vessel Transits: Dale Roads (summer).

12.7.5.13 Consultation has advised that the Dale Roads site (site 7) is also a popular leisure area. Very few tracks were recorded passing through the area in the summer (though many tracks were recorded passing relatively close to the site boundaries) (see Figure 12.13), and no tracks were recorded passing through the site in the winter. Stakeholder consultation confirmed that the density of traffic using Dale Roads (site 7) was much lower than Warrior Way (site 8), although it was noted that the Dale Roads area is occasionally used for power boat training exercises.

12.7.5.14 Consultation has advised that the East Pickard Bay site (site 8) is less intensively used than either Warrior Way (site 6) or Dale Roads (site 7) and is mainly transited by leisure vessels on passage. Very few tracks were recorded passing through the area in the summer (though many tracks were recorded passing relatively close to the site boundary) (see Figure 12.14), and no tracks were recorded passing through the site in the winter. Stakeholder consultation confirmed that the density of traffic using East Pickard Bay (site 8) was much lower than Warrior Way (site 6).

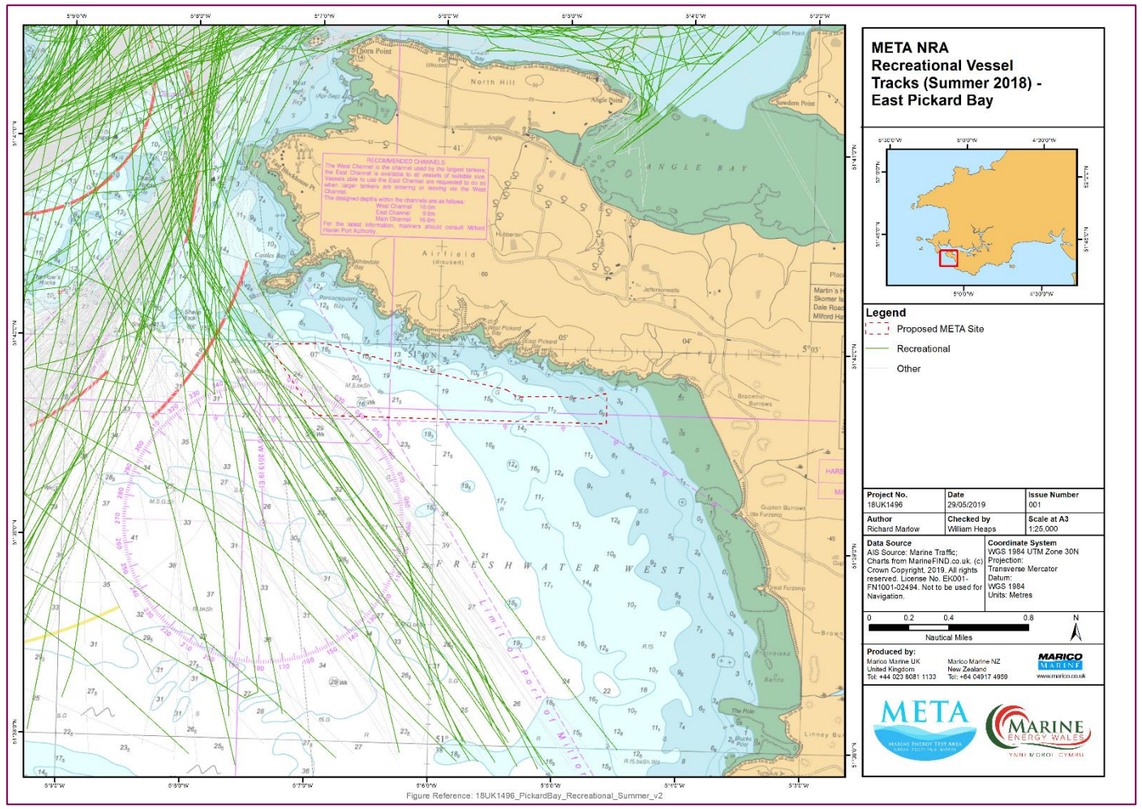

Figure 12.14: Recreational Vessel Transits: East Pickard Bay (summer).

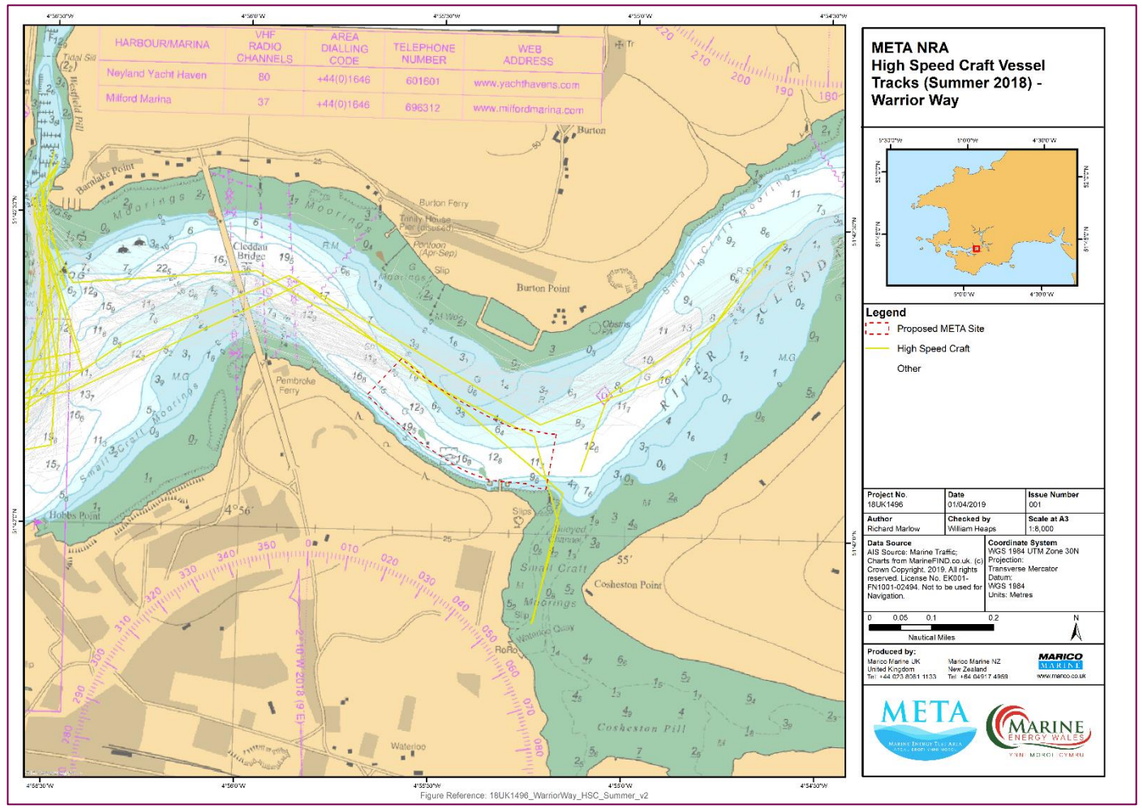

Figure 12.15: High Speed Craft Transits: Warrior Way (summer).

High Speed Craft

12.7.5.15 High-speed craft (likely to be commercial vessels) were recorded in both the summer and winter AIS datasets. These were generally recorded on passage. Occasional tracks were recorded passing through the Warrior Way (site 6) site and largely through the western part of the East Pickard Bay (site 8) site in both seasons. No tracks were recorded passing through the Dale Roads (site 7) site in either season (see Figure 12.15, Figure 12.16 and Figure 12.17).

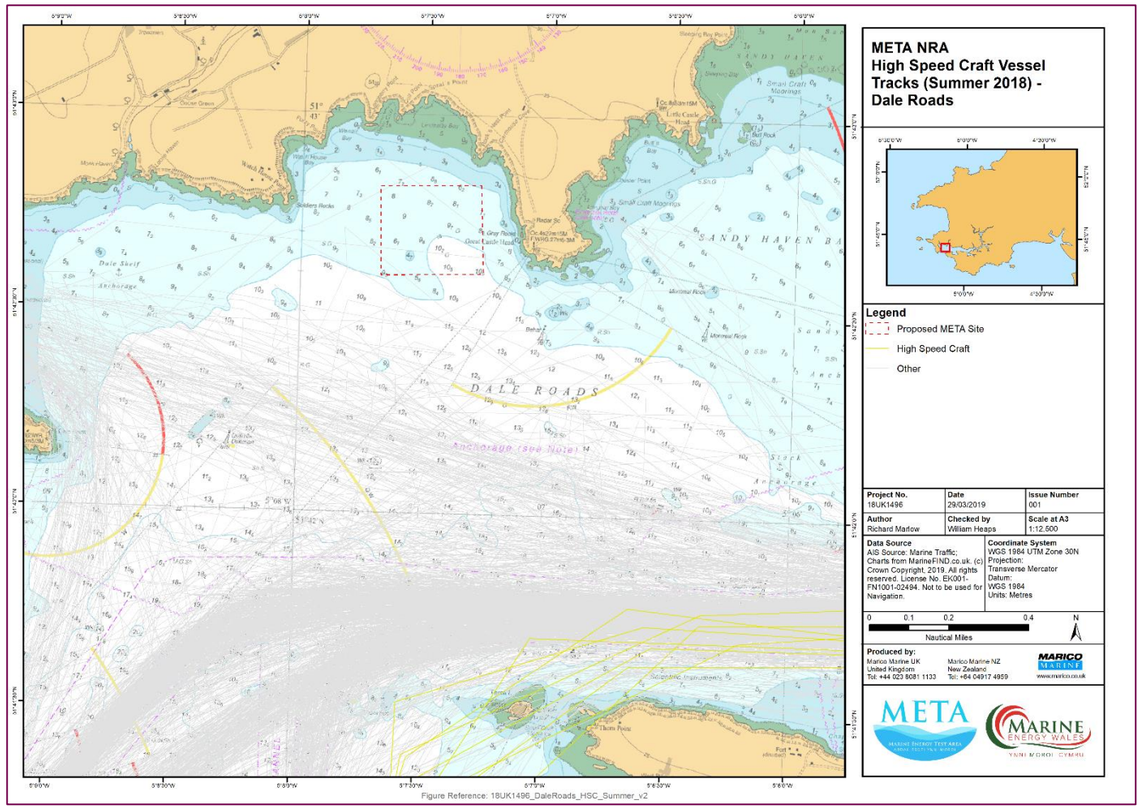

Figure 12.16: High Speed Craft Transits: Dale Roads (summer).

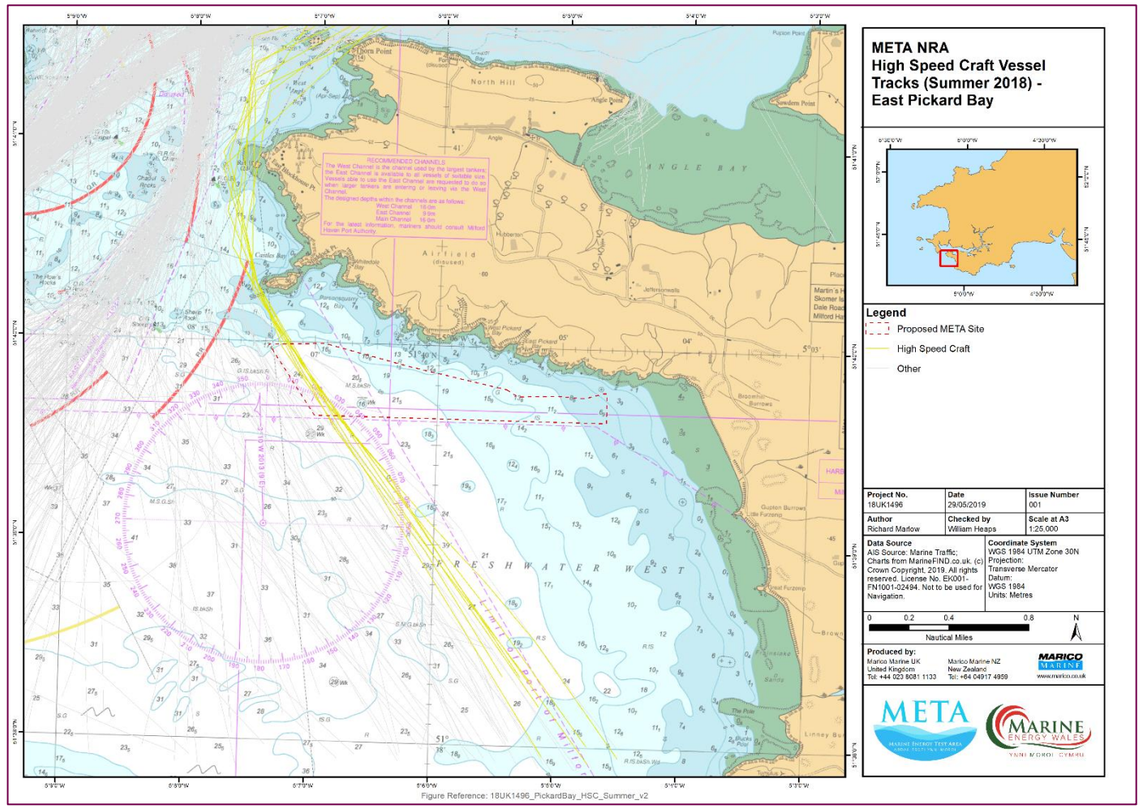

Figure 12.17: High Speed Craft Transits: East Pickard Bay (summer).

Tugs and Other Service Vessels

12.7.5.16 Tugs and other services vessels were rarely recorded in any of the test sites in either season. Tracks were recorded passing the Warrior Way (site 6) site to the north, and a significant number of tracks (representing ship towage tugs) were recorded passing well to the south of Dale Roads (site 7) and to the west of East Pickard Bay (site 8) (see Figure 12.18, Figure 12.19 and Figure 12.20).

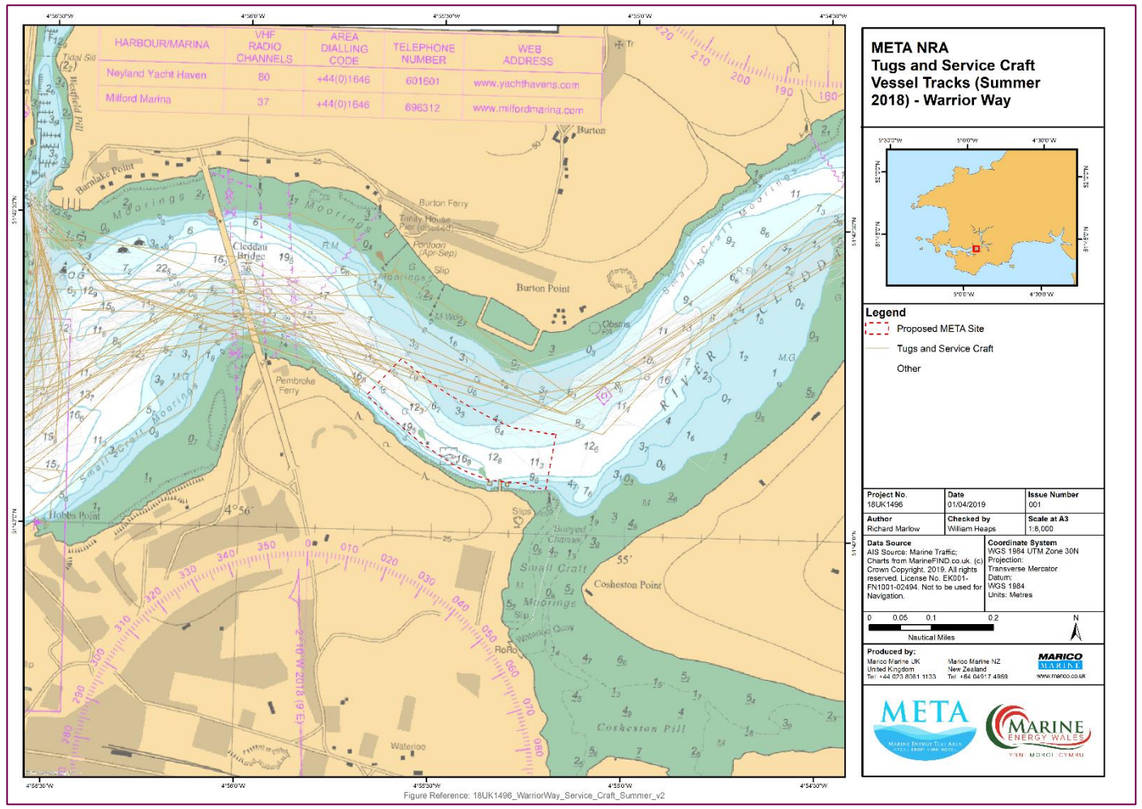

Figure 12.18: Tug and Service Vessel Transits: Warrior Way (summer).

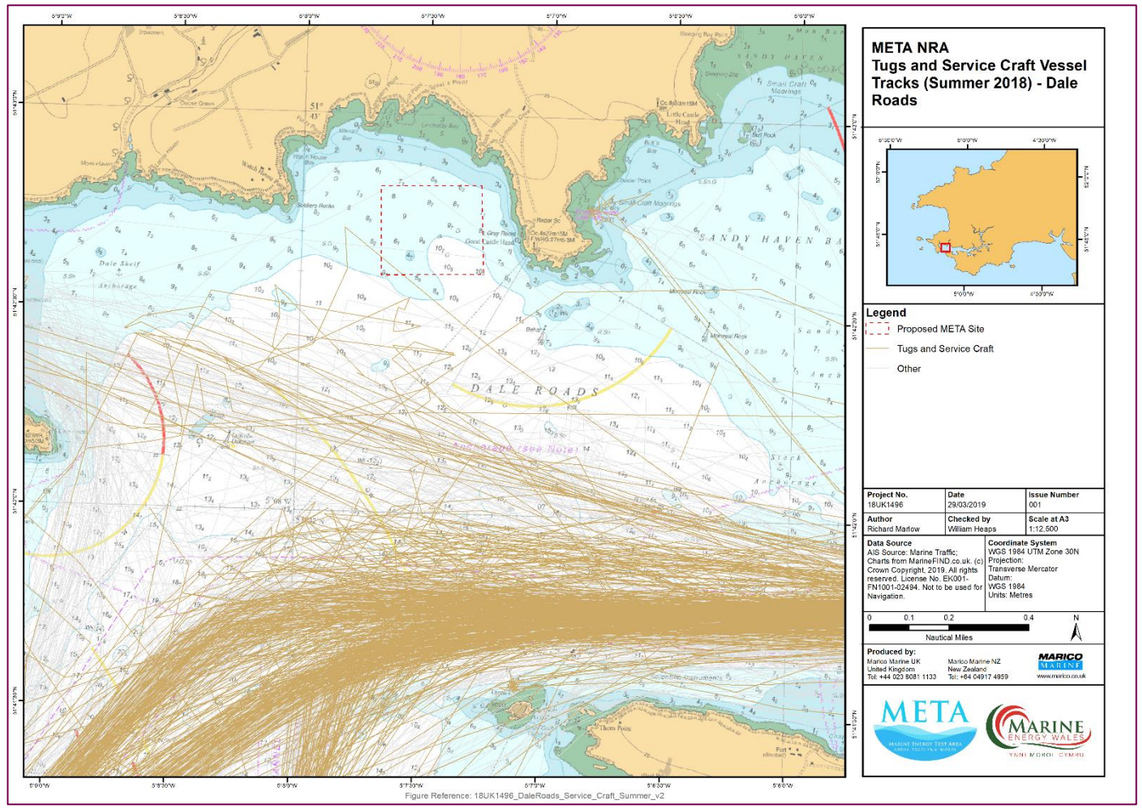

Figure 12.19: Tug and Service Vessel Transits: Dale Roads (summer).

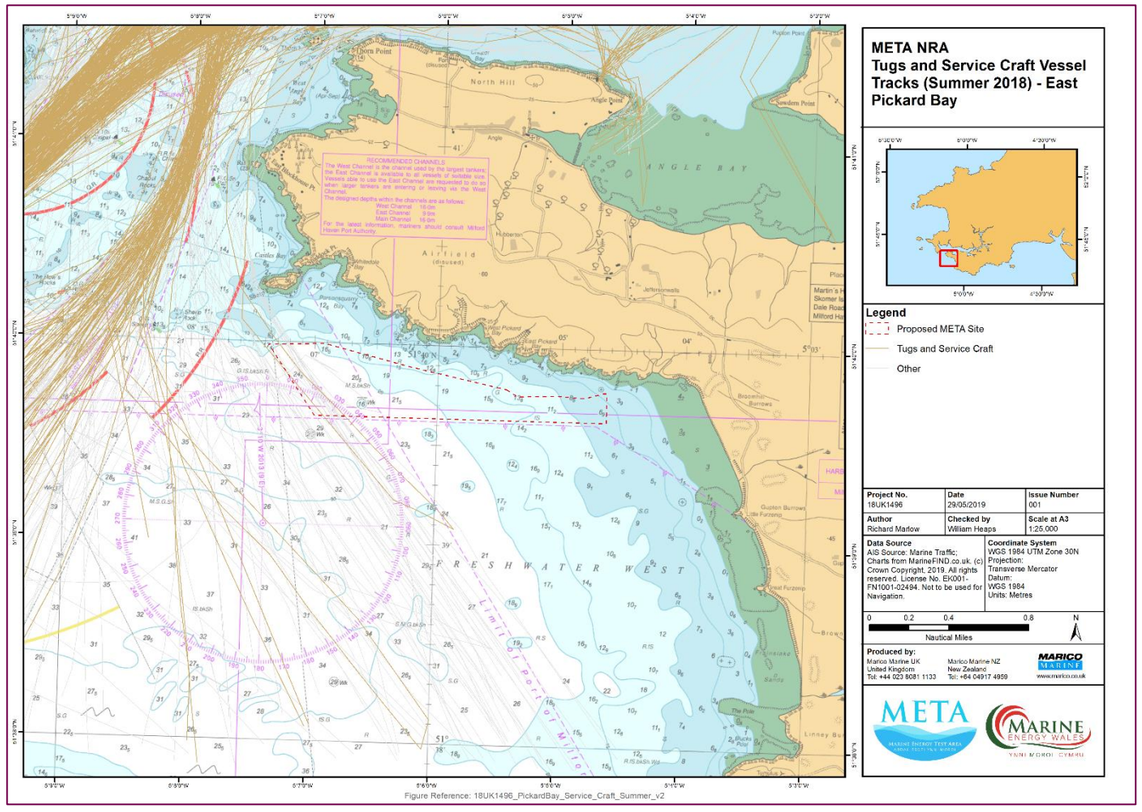

Figure 12.20: Tug and Service Vessel Transits: East Pickard Bay (summer).

12.7.6 Search and Rescue

12.7.6.1 Royal National Lifeboat Institution (RNLI) lifeboats are stationed at Angle on the southern shore of the Waterway. Her Majesty's Coastguard (HMCG) helicopter assets are based at St Athan near Cardiff, and Newquay in Cornwall. Milford Haven Coastguard Operations Centre (CGOC) is the local coastguard base for the region and co-located with the MHPA offices and VTS centre.

12.7.7 Maritime Accidents and Incidents

12.7.7.1 Analysis of MAIB data has identified some 183 incidents in the vicinity of the Waterway over a period of 20 years (between 1997 and 2017). The most common causes were identified as accident to person, mechanical failure/loss of control, contact and grounding. The majority of incidents have been reported as less serious or "marine incidents" (near misses) since recording of incident severity began (in 2012). Most of these statistics will relate to large commercial vessel movements. Incidents involving small vessels (only), especially leisure craft, are unlikely to be represented in MAIB statistics. However, stakeholder consultation confirmed that incidents involving small craft rarely resulted in significant damage or injuries.

12.7.7.2 One incident (mechanical failure) was recorded on the north western boundary of the East Pickard Bay (site 8) site and three other incidents were recorded in relatively close proximity to the west and north of this site. There were no recorded incidents in the immediate vicinity of the Dale Roads (site 7) site and the closest recorded incidents to the Warrior Way (site 6) site were generally at or to the west of the Cleddau Bridge.

12.7.7.3 Incident data was also provided by the MHPA for the period 2013 to 2018. The overall number of marine events (including incidents and near misses) was noted to have increased over this period, however it is considered that this is likely to reflect an industry wide campaign to increase incident and near miss reporting. In general, more incident and near miss reports were recorded in the summer than the winter period, which reflects the greater traffic densities during this period (see section 12.7.5). In terms of incident category (e.g. contact, grounding), review of the data supplied for 2018 corresponded with the evidence provided in the MAIB data.

12.7.8 Future baseline scenario

12.7.8.1 The Marine Works (EIA) Regulations 2007 (as amended) require that "a description of the relevant aspects of the current state of the environment (baseline scenario), and an outline of the likely evolution thereof without implementation of the project, as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the Environmental Statement.

12.7.8.2 In the event that the META project does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

12.7.8.3 The Port of Milford Haven is in the process of expansion through the Milford Waterfront and Pembroke Dock Marine projects, which are likely to result in increased vessel activity within the Waterway. These projects are further considered in the cumulative impact assessment (CIA) presented in section 12.13. The future baseline scenario for recreational activities is considered unlikely to change substantially from that presented in section 12.7.5 in the absence of the META project, although there is an aim to increase visitor numbers outside the peak summer months (Pembrokeshire County Council, 2018) and therefore recreational activities may take place over a longer season.

12.7.9 Data limitations

12.7.9.1 The data sources used in this chapter are detailed in Table 12.4. The data used are the most up to date publicly available information which can be obtained from the applicable data sources as cited, supplemented (following advice from MCA) through wide consultation with local stakeholders as detailed in Table 12.3. The data are therefore limited by what is available and by what has been made available, at the time of writing the Environmental Statement.

12.7.9.2 It is considered that the data employed in the assessment are of a robust nature and are sufficient for the purposes of the impact assessment presented.

12.8 Key parameters for assessment

12.8.1 Maximum and most likely design

12.8.1.1 The maximum design scenarios identified in Table 12.5 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (chapter 2: Project Description). Effects of greater adverse significance are not predicted to arise should any other development scenario based on details within the Project Design Envelope to that assessed here be taken forward in the final design scheme.

12.8.1.2 The most likely design scenarios identified in Table 12.5 have been selected as those having the potential to result in the most likely effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (chapter 2: Project Description). Effects of greater adverse significance are outlined under the maximum design scenario.

12.8.1.3 The Shipping and Navigation assessment will be used to inform the following assessments:

- Fish and Shellfish (chapter 8);
- Marine Mammals, Basking Shark and Otter (chapter 9);
- Marine Ornithology (chapter 10);
- Commercial Fisheries (chapter 11);
- Socio-economic (chapter 15); and
- Other Users (chapter 16).

12.8.2 Impacts scoped out of the assessment

12.8.2.1 On the basis of the baseline environment and the project description outlined in chapter 2: Project Description, a number of impacts are proposed to be scoped out of the assessment for Shipping and Navigation. These impacts are outlined, together with a justification for scoping them out, in Table 12.6.

12.8.2.2 During the preparation of this assessment, additional information was made available than was available during the preparation of the META scoping report. As a result of this, additional impacts have been scoped in to this assessment than were scoped in to the META Scoping Report.

Table 12.5: Maximum and most likely design scenarios considered for the assessment of potential impacts on Shipping and Navigation.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
Installation phase			
Presence of installation 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	Installation of new devices may take place throughout the 15-year consent period. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment, site preparation. • Up to one device deployment occurring at any one time, demarked by up to four navigational marker buoys. • Up to four device deployments in a 12-month period. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Potential for advisory clearance distance around installation activities. • Access via Pembroke Port (vessel length up to 35 m). The Dale Roads (site 7) and East Pickard Bay (site 8) sites are not located within any regularly used routes for any class of vessel considered and are therefore not expected to have any impact on vessel routing within the Waterway or approaches (see Appendix 12.1: Navigational Risk Assessment (NRA)).	Installation of new devices may take place throughout the 15-year consent period. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment, site preparation. • Up to one device deployment occurring at any one time, demarked by up to four navigational marker buoys. • Up to two device deployments in a 12-month period. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Potential for advisory clearance distance around installation activities. • Access via Pembroke Port (vessel length up to 30 m). The Dale Roads (site 7) and East Pickard Bay (site 8) sites are not located within any regularly used routes for any class of vessel considered and are therefore not expected to have any impact on vessel routing within the Waterway or approaches (see Appendix 12.1: Navigational Risk Assessment (NRA)).	Maximum area likely to be demarked by navigational marker buoys or subject to advisory clearance distances leading to the greatest potential for deviations to vessel routes.
Presence of installation activities and associated vessels may lead to potential for interaction between leisure users and META activities	Installation of new devices may take place throughout the 15-year consent period. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment, site preparation. • Devices towed to site and installed on foundations or moorings on the seabed/floating platform/buoy. • Up to one device deployment occurring at any one which may occupy all or part of the water column, demarked by up to four navigational marker buoys. • Up to four device deployments in a 12-month period. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Up to 25 m length, 15 m width, 5 m rotor diameter and up to 2 m height above sea surface. Speed of moving parts up to 5 m/s. • Potential for advisory clearance distance around installation activities. • Up to five vessels required for deployment and retrieval operations with up to 20 deployment and 20 retrieval vessel movements in a 12-month period, restricted to daylight hours, wherever possible. Up to 150 m^2 vessel mooring spread if required. • Access via Pembroke Port (vessel length up to 35 m). Dale Roads • Scaled or full-scale wave energy converter (WEC) devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Up to two device deployments in a 12-month period. • Total area required for single device: up to 600 m^2 (seabed footprint) + up to 200 m^2 (mooring spread for floating devices) = 800 m^2.	Installation of new devices may take place throughout the 15-year consent period. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment, site preparation. • Devices towed to site and deployed from vessel or attached to test support buoys. • Up to one device deployment occurring at any one time which may occupy all or part of the water column, demarked by up to four navigational marker buoys. • Up to two device deployments in a 12-month period. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Up to 5 m length, 5 m width, 5 m rotor diameter and minimal height above sea surface/at sea surface. Speed of moving parts up to 2 m/s. • Potential for advisory clearance distance around installation activities. • Up to three vessels required for deployment and retrieval operations with up to 20 deployment and 20 retrieval vessel movements in a 12-month period, restricted to daylight hours. Up to 50-75 m^2 vessel mooring spread if required. • Access via Pembroke Port (vessel length up to 30 m). Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Up to one device deployment in a 12-month period. • Total area required for single device: up to 200 m^2 (seabed footprint) + up to 100 m^2 (mooring spread for floating devices) = 300 m^2. • Up to 15 m length, 10 m width and height being at the sea surface. • No pin piling required, no associated Safety Zones required.	Maximum number, dimensions and characteristics of test devices and greatest level of activity over the longest duration.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
	• Up to 30 m length, 20 m width and up to 2 m height above sea surface. • Installation of up to four pin piles per device via drilling, with associated Safety Zone likely to be required. • Potential for advisory clearance distance around installation activities. • Up to five vessels required for deployment and retrieval operations with up to 20 deployment and 20 retrieval vessel movements in a 12-month period, restricted to daylight hours, wherever possible. Up to 200 m^2 vessel mooring spread if required. • Access via Pembroke Port (vessel length up to 164 m). East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to two device deployments at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Up to four devices deployed in a 12-month period. • Total area required for single device: up to 33,810 m^2 (sea surface area). For multiple devices: up to 33,910 m^2 (sea surface area) + up to 500,000 m^2 (mooring spread for multiple devices) = 533,910 m^2. • Up to 147 m length, 230 m width and up to 5 m height above sea surface (a maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied). • Installation of up to four pin piles per device via drilling, with associated Safety Zone likely to be required. • Potential for advisory clearance distance around installation activities. • Up to five vessels required for deployment and retrieval operations with up to 40 deployment and 40 retrieval vessel movements in a 12-month period, restricted to daylight hours. Up to 120,000 m^2 vessel mooring spread if required. • Access via local ports (vessel length up to 200 m).	• Potential for advisory clearance distance around installation activities. • Up to three vessels required for deployment and retrieval operations with up to 20 deployment and 20 retrieval vessel movements in a 12-month period, restricted to daylight hours, wherever possible. Up to 100 m^2 vessel mooring spread if required. • Access via Pembroke Port (vessel length up to 164 m). East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Up to one device deployed in a 12-month period. • Total area required for single device: up to 1,700 m^2 (seabed footprint) + up to 625 m^2 (mooring spread for a single device) = 2,325 m^2. • Up to 80 m length, 17 m width and minimal height above sea surface/at sea surface. • No pin piling required, no associated Safety Zones required. • Potential for advisory clearance distance around installation activities. • Up to three vessels required for deployment and retrieval operations with up to 20 deployment and 20 retrieval vessel movements in a 12-month period, restricted to daylight hours, wherever possible. Up to 70,000 m^2 vessel mooring spread if required. • Access via local ports (vessel length up to 200 m).	
Operation and maintenance phase			
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	Operational testing throughout the year and not restricted to daylight hours, however maintenance activities will be restricted to daylight hours, wherever possible. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time, demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Potential for advisory clearance distance around maintenance activities. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity:6 months • Up to 104 vessel visits in a 12-month period.	Operational testing throughout the year and not restricted to daylight hours, however maintenance activities will be restricted to daylight hours, wherever possible. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time, demarked by up to four navigational marker buoys. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Potential for advisory clearance distance around maintenance activities. • Up to two device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 3 months. • Up to 52 vessel visits in a 12-month period.	Maximum area likely to be demarked by navigational marker buoys and maximum level of operational and maintenance activity leading to the greatest potential for deviations to vessel routes.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
	• Up to five vessels may be utilised at any one time for operation and maintenance activity. • Access via Pembroke Port (vessel length up to 35 m). The Dale Roads (site 7), and East Pickard Bay (site 8) sites are not located within any regularly used routes for any class of vessel considered and are therefore not expected to have any impact on vessel routing within the Waterway or approaches (see Appendix 12.1: Navigational Risk Assessment (NRA)). Potential for increased risk of grounding is considered within Table 12.6.	• Up to three vessels may be utilised at any one time for operation and maintenance activity. • Access via Pembroke Port (vessel length up to 30 m). The Dale Roads (site 7), and East Pickard Bay (site 8) sites are not located within any regularly used routes for any class of vessel considered and are therefore not expected to have any impact on vessel routing within the Waterway or approaches (see Appendix 12.1: Navigational Risk Assessment (NRA)). Potential for increased risk of grounding is considered within Table 12.6.	
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)	Operational testing throughout the year and not restricted to daylight hours, however maintenance activities will be restricted to daylight hours, wherever possible. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Up to 25 m length, 15 m width, 5 m rotor diameter and up to 2 m height above sea surface. Speed of moving parts up to 5 m/s. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 6 months Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 600 m^2 (sea area/seabed footprint) + up to 200 m^2 (mooring spread) = 800 m^2. • Up to 30 m length, 20 m width and up to 2 m height above sea surface. • Up to two device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 100% of that time) East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to two device deployments occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for multiple devices: up to 33,910 m^2 (sea surface area) + up to 500,000 m^2 (mooring spread) = 533,910 m^2. • Up to 147 m length, 230 m width and up to 5 m height above sea surface (a maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied).	Operational testing throughout the year and not restricted to daylight hours, however maintenance activities will be restricted to daylight hours, wherever possible. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Up to 5 m length, 5 m width, 5 m rotor diameter and minimal height above sea surface/at sea surface. Speed of moving parts up to 2 m/s. • Up to two device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 3 months Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 100 m^2 (mooring spread) = 300 m^2. • Up to 15 m length, 10 m width and height being at the sea surface. • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 6 months (with the device in the water for 80% of that time) East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for single device: up to 1,700 m^2 (seabed footprint) + up to 625 m^2 (mooring spread for a single device) = 2,325 m^2. • Up to 80 m length, 17 m width and minimal height above sea surface/at sea surface. • Up to one tow test in a 12-month period • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 80% of that time)	Maximum number, dimensions and characteristics of test devices and greatest level of activity over the longest duration.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
	• Up to two tow testing activities in a 12-month period. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 18 months (with the device in the water for 100% of that time)		
Physical presence of devices may reduce under keel clearance	Operational testing throughout the year and not restricted to daylight hours. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Up to 25 m length, 15 m width, 5 m rotor diameter and up to 2 m height above sea surface. Speed of moving parts up to 5 m/s. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 6 months Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 600 m^2 (sea area/seabed footprint) + up to 200 m^2 (mooring spread) = 800 m^2. • Up to 30 m length, 20 m width and up to 2 m height above sea surface. • Up to two device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 100% of that time) East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to two device deployments occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for multiple devices: up to 33,910 m^2 (sea surface area) + up to 500,000 m^2 (mooring spread) = 533,910 m^2. • Up to 147 m length, 230 m width and up to 5 m height above sea surface (a maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied). • Up to two tow testing activities in a 12-month period. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 18 months (with the device in the water for 100% of that time)	Operational testing throughout the year and not restricted to daylight hours. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Up to 5 m length, 5 m width, 5 m rotor diameter and minimal height above sea surface/at sea surface. Speed of moving parts up to 2 m/s. • Up to two device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 3 months Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 100 m^2 (mooring spread) = 300 m^2. • Up to 15 m length, 10 m width and height being at the sea surface. • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 6 months (with the device in the water for 80% of that time) East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for single device: up to 1,700 m^2 (seabed footprint) + up to 625 m^2 (mooring spread for a single device) = 2,325 m^2. • Up to 80 m length, 17 m width and minimal height above sea surface/at sea surface. • Up to one tow test in a 12-month period • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 80% of that time)	

Potential impact	Maximum design scenario	Most likely design scenario	Justification
Physical presence of devices may increase risk of gear/anchor snagging	Operational testing throughout the year and not restricted to daylight hours. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Up to 25 m length, 15 m width, 5 m rotor diameter and up to 2 m height above sea surface. Speed of moving parts up to 5 m/s. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 6 months. Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 600 m^2 (sea area/seabed footprint) + up to 200 m^2 (mooring spread) = 800 m^2. • Up to 30 m length, 20 m width and up to 2 m height above sea surface. • Up to two device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 100% of that time) East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to two device deployments at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for multiple devices: up to 33,910 m^2 (sea surface area) + up to 500,000 m^2 (mooring spread) = 533,910 m^2. • Up to 147 m length, 230 m width and up to 5 m height above sea surface (a maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied). • Up to two tow testing activities in a 12-month period. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 18 months (with the device in the water for 100% of that time)	Operational testing throughout the year and not restricted to daylight hours. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment. • Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Up to 5 m length, 5 m width, 5 m rotor diameter and minimal height above sea surface/at sea surface. Speed of moving parts up to 2 m/s. • Up to two device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 3 months. Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 100 m^2 (mooring spread) = 300 m^2. • Up to 15 m length, 10 m width and height being at the sea surface. • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 6 months (with the device in the water for 80% of that time) East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for single device: up to 1,700 m^2 (seabed footprint) + up to 625 m^2 (mooring spread for a single device) = 2,325 m^2. • Up to 80 m length, 17 m width and minimal height above sea surface/at sea surface. • Up to one tow test in a 12-month period • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 80% of that time)	Maximum number, dimensions and characteristics of test devices and associated moorings over the longest duration.
Physical presence of devices may lead to potential for interaction between leisure users and the device	Operational testing throughout the year and not restricted to daylight hours. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment.	Operational testing throughout the year and not restricted to daylight hours. Up to 15 years total duration of consent. Warrior Way • Scaled or micro tidal devices, instruments, components and subassemblies, monitoring equipment.	Maximum number, dimensions and characteristics of test devices and greatest level of activity over the longest duration.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
	• Up to one device deployment occurring at any one time which may occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 150 m^2 (mooring spread) = 350 m^2. • Up to 25 m length, 15 m width, 5 m rotor diameter and up to 2 m height above sea surface. Speed of moving parts up to 5 m/s. • Up to four device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 6 months (with the device in the water for 100% of that time) • Up to 104 vessel visits in a 12-month period. • Up to five vessels utilised at any one time for operation and maintenance activity. • Access via Pembroke Port (vessel length up to 35 m). Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 600 m^2 (sea area/seabed footprint) + up to 200 m^2 (mooring spread) = 800 m^2. • Up to 30 m length, 20 m width and up to 2 m height above sea surface. • Up to two device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 100% of that time) • Up to 104 vessel visits in a 12-month period. • Up to five vessels utilised at any one time for operation and maintenance activity. • Access via Pembroke Port (vessel length up to 164 m). East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to two device deployments at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for multiple devices: up to 33,910 m^2 (sea surface area) + up to 500,000 m^2 (mooring spread) = 533,910 m^2. • Up to 147 m length, 230 m width and up to 5 m height above sea surface (a maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied). • Up to two tow testing activities in a 12-month period. • Up to four device deployments in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 18 months (with the device in the water for 100% of that time) • Up to 150 vessel visits in a 12-month period. • Up to five vessels utilised at any one time for operation and maintenance activity. • Access via local ports (vessel length up to 200 m).	• Up to one device deployment occurring at any one time which m ay occupy all or part of the water column and demarked by up to four navigational marker buoys. • Total area required for single device: up to 100 m^2 (sea area/seabed footprint) + up to 75 m^2 (mooring spread) = 175 m^2. • Up to 5 m length, 5 m width, 5 m rotor diameter and minimal height above sea surface/at sea surface. Speed of moving parts up to 2 m/s. • Up to two device deployments in a 12-month period • Maximum duration of moored/gravity base deployment activity: 3 months (with the device in the water for 80% of that time) • Up to 52 vessel visits in a 12-month period. • Up to three vessels utilised at any one time for operation and maintenance activity. • Access via Pembroke Port (vessel length up to 30 m) Dale Roads • Scaled or full-scale WEC devices, research and monitoring methodologies. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, demarked by up to four navigational marker buoys. • Total area required for single device: up to 200 m^2 (sea area/seabed footprint) + up to 100 m^2 (mooring spread) = 300 m^2. • Up to 15 m length, 10 m width and height being at the sea surface. • Up to one device deployment in a 12-month period • Maximum duration of moored/gravity base deployment activity: 6 months (with the device in the water for 80% of that time) • Up to 52 vessel visits in a 12-month period. • Up to three vessels utilised at any one time for operation and maintenance activity. • Access via Pembroke Port (vessel length up to 164 m). East Pickard Bay • Scaled or full-scale WEC device testing and component testing for floating offshore wind technology, rock ballasting. • Up to one device deployment occurring at any one time which may occupy a significant proportion of the water column and may include surface-piercing, at surface and sub-surface components, demarked by up to four navigational marker buoys. • Total area required for single device: up to 1,700 m^2 (seabed footprint) + up to 625 m^2 (mooring spread for a single device) = 2,325 m^2. • Up to 80 m length, 17 m width and minimal height above sea surface/at sea surface. • Up to one tow test in a 12-month period • Up to one device deployment in a 12-month period. • Maximum duration of moored/gravity base deployment activity: 12 months (with the device in the water for 80% of that time) • Up to 104 vessel visits in a 12-month period. • Up to three vessels utilised at any one time for operation and maintenance activity. • Access via local ports (vessel length up to 200 m).	

Potential impact	Maximum design scenario	Most likely design scenario	Justification
Decommissioning phase			
Presence of 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	As per Installation Phase	As per Installation Phase	As per Installation Phase
Presence of decommissioning activities and associated vessels may lead to potential for interaction between leisure users and META activities	As per Installation Phase	As per Installation Phase	As per Installation Phase

Table 12.6: Impacts scoped out of the assessment for Shipping and Navigation.

Potential impact	Justification
Installation, operation and maintenance, and decommissioning phases	
Physical presence of devices may displace vessels leading to increased vessel to vessel collision risk	It is considered that the potential for the physical presence of devices to increase the risk of vessel to vessel collision due to increased traffic density and the potential for vessels to deviate to avoid the test areas, can be scoped out of the assessment due to the designed-in measures including promulgation of information through Notices to Mariners and appropriate navigational marking and charting, which will ensure that mariners are aware of the location of the devices and can plan accordingly. Existing port traffic management measures will also remain effective, including clear channel marking, proactive VTS traffic management and zoning of the Waterway. It is recommended that MHPA review minimum levels of competence and local knowledge for all commercial vessel masters using the SHA area, even if vessel sizes are small and masters may not require STCW certification. As described in section 12.7.5, vessels transiting in the vicinity of Warrior Way (site 6) in the upper Waterway are most likely to be recreational vessels, high speed craft and tugs/other service vessels; vessels transiting in the vicinity of Dale Roads (site 7) are most likely to be recreational vessels and seasonal sight-seeing passenger vessels, although commercial vessels anchor to the south and the Irish Sea ferry, commercial vessels and tugs/other service vessels also transit to the south of the site; and vessels transiting in the vicinity of East Pickard Bay (site 8) are most likely to be recreational vessels, seasonal sight-seeing passenger vessels and high speed craft, although the Irish Sea ferry, commercial vessels and tugs/other service vessels also transit to the west of the site This potential impact is considered within the NRA for Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) under the hazard “Collision” which considers the potential for vessel to vessel collisions due to a range of possible causes including a vessel altering course to avoid a test device or area and traffic density. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable) for Warrior Way (site 6) and Dale Roads (site 7). For East Pickard Bay (site 8), the overall risk rating was considered to be low (Acceptable) for collision between tugs/service craft and recreational vessels, tugs/service craft and commercial vessels, tugs/service craft and passenger vessels and recreational vessels and passenger vessels; and ALARP for collision between recreational vessels and commercial vessels and commercial vessels and passenger vessels (although as described in the NRA, the ALARP risks would remain within the area assessed whether or not the test devices and associated navigational activities (i.e. device support vessels) were present). This impact has therefore been scoped out of further assessment.
Physical presence of devices may increase vessel to structure allision risk	It is considered that the potential for the physical presence of devices to increase the risk of vessel to structure allision (when a vessel is under power), can be scoped out of the assessment due to the designed-in measures including promulgation of information through Notices to Mariners and appropriate navigational marking and charting which will ensure that mariners are aware of the location of the devices and can plan accordingly. Existing port traffic management measures will also remain effective, including clear channel marking, proactive VTS traffic management and zoning of the Waterway. It is recommended that MHPA review minimum levels of competence and local knowledge for all commercial vessel masters using the SHA area, even if vessel sizes are small and masters may not require STCW certification. This impact has therefore been scoped out of further assessment.
Installation and maintenance activities and physical presence of devices may increase risk of grounding at Dale Roads (site 7) and East Pickard Bay (site 8)	This potential impact is considered within the NRA for Dale Roads (site 7) and East Pickard Bay (site 8) under the hazard “grounding” which considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to ground due to a range of possible causes including unplanned course alteration due to traffic density or position of devices. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable) for Dale Roads (site 7). For East Pickard Bay (site 8), the overall risk rating was considered to be low (Acceptable) for passenger vessels, recreational vessels and tugs/service craft; and ALARP for commercial vessels (although as described in the NRA, the ALARP risks would remain within the area assessed whether or not the test devices and associated navigational activities (i.e. device support vessels) were present). This impact has therefore been scoped out of further assessment.
Physical presence of devices and associated operations may reduce SAR and pollution response capabilities	Due to the relatively small spatial extent of the device footprints and short duration of most device-deployment scenarios, there is not expected to be any impact on SAR and emergency response (see Appendix 12.1: Navigational Risk Assessment (NRA)). An Operational Management Plan (including Emergency Response) will be developed and implemented for the installation and operation and maintenance phases of the META project, in consultation with the MHPA/MCA (see Table 12.10). This impact has therefore been scoped out of further assessment.
The META devices may result in interference with communications, radar and positioning systems	No impacts are anticipated on communications, radar or positioning systems from the operation of the test devices. This impact has therefore been scoped out of further assessment.
Potential for device breakout due to mooring failure leading to hazard to navigation	The potential for device breakout due to mooring failure (e.g. due to adverse weather) was identified during stakeholder consultation. Due to the prevailing wind direction at all three test sites it is considered likely that any free-floating device will quickly reach the shore. The test devices and associated moorings will be designed to withstand the environmental conditions at the particular test site, therefore it is considered unlikely that device breakout will occur under normal conditions. In addition, most devices are likely to have tracking systems installed so that in the event of mooring failure, they would be easily trackable. This potential impact is considered within the NRA for Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) under the hazard “Breakout of a test device” which considers the potential for a test device to break free and present a hazard to other shipping due to a range of possible causes including mooring system failure or failure to follow maintenance procedures. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable) for each site. This impact has therefore been scoped out of further assessment.
Installation and maintenance of devices may increase risk of dropped objects leading to obstructions on the seabed	The potential for dropped objects during installation and maintenance of marine energy test devices will be controlled through appropriate META project and device-specific procedures. META project procedures will include implementation of an Environmental Management Plan which will set out the key management measures that contractors and clients will be required to adopt and implement, including strategies and control measures for managing the potential for dropped objects. Device developers testing at META sites will be expected to implement device-specific environmental management measures that comply with the META project EMP. Any dropped objects will be reported to the MHPA and NRW with discussion taking place on potential remedial measures (e.g. retrieval where possible). This impact has therefore been scoped out of further assessment.

12.9 Impact assessment methodology

12.9.1 Overview

12.9.1.1 The Shipping and Navigation EIA has followed the methodology set out in chapter 4: Environmental Impact Assessment Methodology. Specific to the Shipping and Navigation EIA, the following guidance documents have also been considered:

- MGN 543 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) –Guidance on UK Navigational Practice, Safety and Emergency Response;
- MGN 372 Guidance to Mariners Operating in the Vicinity of UK OREIs;
- IALA (2013) IALA Recommendation O-139 on the Marking of Man-Made Offshore Structures;
- International Maritime Organisation (IMO) (2018) Formal Safety Assessment;
- RYA (2015a) The RYA's Position on Offshore Renewable Energy Developments: Paper 2 (of 4) – Wave Energy, September 2015;
- RYA (2015b) The RYA's Position on Offshore Renewable Energy Developments: Paper 3 (of 4) – Tidal Energy, September 2015;
- HSE and MCA (2017) Regulatory expectations on moorings for floating wind and marine devices;
- MCA (2013) Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI); and
- MCA (2014) Under Keel Clearance – Policy Paper, Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices.

12.9.2 Navigational Risk Assessment

12.9.2.1 Potential impacts on Shipping and Navigation receptors are assessed primarily in accordance with guidance provided by the MCA, as listed within section 12.9.1. The MCA require that their methodology is used as a template for undertaking impact assessments (see MCA, 2013). This template is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place in order for the assessed risk to be judged as Acceptable or As Low as Reasonably Practicable (ALARP).

12.9.2.2 Appendix 12.1: Navigational Risk Assessment (NRA) presents the results of this assessment, including a description of the assessment methodology. In summary, the NRA process starts with the identification of all potential hazards. It then assesses the likelihood (frequency) of a hazard causing an incident and considers the possible consequences of that incident for two scenarios, namely the “most likely” and the “worst credible”[1]. Consequence and frequency are combined using a risk matrix which enables hazards to be ranked and a risk score assigned (taking into account the existing mitigation measures as set out in section 12.10). The risk score is divided into three general categories:

- Acceptable;
- As Low as Reasonably Practicable (ALARP); and
- Intolerable.

12.9.2.3 The methodology used in the NRA determines where to prioritise risk control options for the navigational aspects of a project site. It is recommended that the outcome of this risk assessment process feeds into the META project Operational Management Plan (see Table 12.10) which will be developed in consultation with the MHPA/MCA, to manage navigational risk. In the case of Milford Haven, the overarching marine safety management system is the responsibility of the Harbour Authority (MHPA).

12.9.2.4 The EIA for Shipping and Navigation has interpreted the NRA to inform the assessment by considering risk within the assessment of magnitude (see Table 12.7).

12.9.3 Impact assessment criteria

12.9.3.1 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those which are described in further detail in chapter 4: Environmental Assessment Methodology.

12.9.3.2 The criteria for defining magnitude in this chapter are outlined in Table 12.7 below.

Table 12.7: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
Major	Loss or alteration to large portion or all of key components of current activity and/or impact is of extended physical extent and/or long-term duration and/or the frequency or risk of occurrence is continuous and/or effect is not reversible for project design life and/or risk is Intolerable.
Moderate	Loss or alteration to significant proportions of key components of current activity and/or physical extent of impact is moderate and/or medium-term duration and/or the frequency or risk of occurrence is medium to continuous and/or effect is not reversible for project phase and/or risk is ALARP.
Minor	Minor shift away from baseline, leading to reduction in level of activity that may be undertaken and/or physical extent of impact is low and/or short to medium term and/or the frequency or risk of occurrence is low to continuous and/or effect is not reversible for project phase and/or risk is Acceptable or ALARP.
Negligible	Very slight change from baseline conditions and/or physical extent of impact is negligible and/or short-term duration and/or the frequency or risk of occurrence is negligible to continuous and/or effect is reversible and/or risk is Acceptable.
No change	No change from baseline conditions.

12.9.3.3 The criteria for defining sensitivity in this chapter are outlined in Table 12.8 below.

[1] Note that these scenarios are separate to the META Maximum Design Scenario and Most Likely Scenario.

Table 12.8: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
Very High	Receptor is of critical importance to the local, regional or national economy and/or the receptor is highly vulnerable to impacts with regard to navigation safety that may arise from the project and/or recoverability is long-term or not possible.
High	Receptor is of high value to the local, regional or national economy and/or the receptor is generally vulnerable to impacts with regard to navigational safety that may arise from the project and/or recoverability is slow and/or costly.
Medium	Receptor is of medium value to the local, regional or national economy and/or the receptor is somewhat vulnerable to impacts with regard to navigational safety that may arise from the project and/or has medium to high levels of recoverability.
Low	Receptor is of low value to the local, regional or national economy and/or the receptor is not generally vulnerable to impacts with regard to navigational safety that may arise from the project and/or has high recoverability.
Negligible	Receptor is of negligible value to the local, regional or national economy and/or the receptor is not vulnerable to impacts with regard to navigational safety that may arise from the project and/or has high recoverability.

12.9.3.4 The significance of the effect upon Shipping and Navigation is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 12.9. Where a range of significance of effect is presented in Table 12.9, the final assessment for each effect is based upon expert judgement.

12.9.3.5 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 12.9: Matrix used for the assessment of the significance of the effect.

Sensitivity of receptor \ Magnitude of impact	No change	Negligible	Minor	Moderate	Major
Negligible	Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible	Negligible or minor	Minor	Moderate	Moderate or major
High	Negligible	Minor	Minor or moderate	Moderate or major	Major or substantial
Very high	Negligible	Minor	Moderate or major	Major or substantial	Substantial

12.10 Measures adopted as part of the META Project

12.10.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for impacts on Shipping and Navigation (see Table 12.10). As there is a commitment to implementing these measures, they are considered inherently part of the design of the META project and have therefore been considered in the assessment presented in section 12.11 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 12.10: Designed-in measures adopted as part of the META project.

Measures adopted as part of the META project	Justification
Promulgation of information including Notices to Mariners issued before and during every device deployment, advising on the location, timings and other relevant information. Information and notices will also be posted at onshore locations, this may include signage if appropriate/possible. MEW plans to create a database of known users (including yacht clubs and local activity centres) to act as a mailing list for direct issue of Notices to Mariners.	Notices to mariners will be issued and sent directly to an email list of registered interested parties to help ensure that as many interested parties as possible are aware of the presence of infrastructure and the need to avoid the area during the period of deployment. Signage may help mitigate potential interactions between small craft navigators and device deployments.
Navigational marker buoys and/or other Aids to Navigation will be deployed on a device-specific basis, as directed by MHPA and/or MCA and THLS, to demarcate testing activities.	MEW will liaise with MHPA and/or MCA and THLS to ensure areas and devices are appropriately marked for navigational safety.
Marine charting (where appropriate).	Where appropriate (e.g. depending on the duration of the deployment), sites will be marked on nautical charts and publications, with suitable chart notes.
Safety Zones may be applied for around any pin piling activities during the installation phase.	Safety Zones are established in the interests of safety to other mariners, in accordance with The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.
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 MHPA on a case-by-case basis.	Advisory clearance distances are recommended in the interests of navigational safety.
MEW will consider the use of safety vessels/guard boats during short-term installation/decommissioning activities and during short-term deployments, subject to the results of the device-specific risk assessment and following discussion with the navigational authorities.	To ensure other traffic does not encroach on the test device.
Compliance with International Maritime Organisation Conventions including COLREGs and SOLAS.	To ensure that standard levels of navigation and vessel safety are adhered to by all project related vessels.
META project Operational Management Plan (including Emergency Response).	This will be developed and implemented for the installation and operation and maintenance phases of the META project, in consultation with the MHPA/MCA, to manage navigational risk. To include for emergency shut down of devices in the event of an emergency situation. It is recommended that the outcome of the NRA process feeds into the Plan. The Plan will include a requirement for device-specific risk assessments to be prepared in advance of each specific device deployment to ensure that any risks to leisure users are minimised to ALARP or lower.

12.11 Assessment of significance

12.11.1 Installation phase

12.11.1.1 The impacts of the installation of the META project have been assessed on Shipping and Navigation. The potential impacts arising from the installation of the META project are listed in Table 12.5, along with the maximum and most likely design scenarios against which each installation phase impact has been assessed. A conclusion of significance of effect will be made for the META project and for each META Phase 2 site individually where appropriate (Warrior Way (site 6), Dale Roads (site 7); East Pickard Bay (site 8)).

12.11.1.2 A description of the potential effect on Shipping and Navigation receptors caused by each identified impact is given below.

Presence of installation 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

Magnitude of impact

12.11.1.3 The presence of installation activities and associated vessels at Warrior Way (site 6) may deviate vessel routes leading to a loss of navigable space. The Dale Roads (site 7), and East Pickard Bay (site 8) sites are not located within any regularly used routes for any class of vessel considered and are therefore not expected to have any impact on vessel routing within the Waterway or approaches (see Appendix 12.1: Navigational Risk Assessment (NRA)).

12.11.1.4 The maximum design scenario for Warrior Way (site 6) is represented by a single floating device deployment which may have a total area of up to 350 m^2 including the mooring spread. The most likely design scenario is represented by a single floating device deployment which may have a total area of up to 175 m^2 including the mooring spread. The device will be demarked by up to four navigational marker buoys. Any temporary advisory clearance distances around installation vessels and activities may extend beyond the device footprints of the respective areas.

12.11.1.5 As described in section 12.7, vessels transiting in the vicinity of Warrior Way (site 6) in the upper Waterway are most likely to be recreational vessels, high speed craft and tugs/other service vessels. Warrior Way (site 6) is located in a relatively narrow section of the Waterway measuring approximately 340 m in width (from/to mean low water). The site boundaries encompass the deep-water channel to the east of the Cleddau bridge, and during consultation stakeholders expressed concern that vessels may be deviated to shallower water to the north (see Table 12.3). However, in practice, only a small part of the test area will be used at any one time, and this will have minimal impact on vessel routing.

12.11.1.6 The impact of any temporary advisory clearance distances would be reversible as once each device has been installed these will be removed. Installation of single devices at any one time may take place throughout the 15-year consent period therefore temporary advisory clearance distances may be recommended periodically during this timeframe.

12.11.1.7 This potential impact is considered within the NRA for Warrior Way (site 6) under the hazard “grounding” which considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to ground due to a range of possible causes including unplanned course alteration due to traffic density or position of devices. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable).

12.11.1.8 The impact at Warrior Way (site 6) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

12.11.1.9 It is anticipated that vessels will be able to transit past the Warrior Way (site 6) site during installation activities. Installation activities and any associated temporary advisory clearance distances would be communicated in advance via Notices to Mariners as described in Table 12.10, ensuring that vessels can plan their routes accordingly. The Warrior Way (site 6) site is located within the SHA area and is therefore subject to existing port traffic management measures (where relevant) as identified in section 12.7.3.

12.11.1.10 The Shipping and Navigation receptor is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of the effect

12.11.1.11 Overall, the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Presence of installation activities and associated vessels may lead to potential for interaction between leisure users and META activities

Magnitude of impact

12.11.1.12 The installation 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. For example, consultation identified the potential for kayakers to investigate the devices at East Pickard Bay (site 8) (see Table 12.3), increasing risk of contact with the device, although this was considered unlikely (see Appendix 12.1: Navigational Risk Assessment (NRA)). This potential impact is considered for each site in turn below.

Warrior Way

12.11.1.13 The maximum design scenario for Warrior Way (site 6) is represented by a single floating tidal device deployment of up to 25 m in length, 15 m in width and up to 2 m height above sea surface, with a rotor diameter of up to 5 m. The most likely design scenario is represented by a single floating tidal device deployment of up to 5 m in length, 5 m in width and minimal height above/at sea surface, with a 5 m rotor diameter. The device would not be active during the installation phase. The site would be demarked by up to four navigational marker buoys and there may be temporary advisory clearance distances around installation activities and associated vessels. Installation of single devices at any one time may take place throughout the 15-year consent period.

12.11.1.14 As described in section 12.7.5, the Warrior Way (site 6) site is intensively used for recreational purposes including youth sail training and other activities, and there are likely to be inexperienced leisure users in this area. There is potential for local leisure users to investigate the installation works, however training activities would be subject to supervision and therefore this is considered to reduce the extent of this impact.

12.11.1.15 This potential impact is considered within the NRA for Warrior Way (site 6) under the hazards "contact with fixed structure" and "contact with floating object". The hazard "contact with fixed structure" considers the potential for vessels (including recreational vessels) to contact a fixed structure (e.g. fixed foundation) due to a range of possible causes including poor seamanship, aids to navigation out of position/unlit, or obstruction (e.g. test device) not charted or promulgated. The hazard "contact with floating object" considers the potential for vessels (including recreational vessels) to contact a floating object (e.g. navigation aid or test device) due to a range of possible causes including an obstruction (e.g. test device) not charted or promulgated, or kayakers or similar making an unauthorised visit. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.1.16 The impact at Warrior Way (site 6) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Dale Roads

12.11.1.17 The maximum design scenario for Dale Roads (site 7) is represented by a single floating wave device deployment of up to 30 m in length, 20 m in width and up to 2 m height above sea surface. The most likely design scenario is represented by a single floating wave device deployment of up to 15 m in length, 10 m in width and height at sea surface. The device would not be active during the installation phase. The site would be demarked by up to four navigational marker buoys and there may be a Safety Zone around any piling activity required for fixed foundations and temporary advisory clearance distances around installation activities and associated vessels. Installation of single devices at any one time may take place throughout the 15-year consent period.

12.11.1.18 As described in section 12.7.5, the Dale Roads (site 7) site is a popular leisure area for cruising/passage, with occasional yacht anchoring and power boat training exercises. However, the area is less intensively used by leisure vessels than Warrior Way (site 6) and therefore there is considered to be low potential for local leisure users to investigate the installation works at the Dale Roads (site 7) site.

12.11.1.19 This potential impact is considered within the NRA for Dale Roads (site 7) under the hazards "contact with fixed structure" and "contact with floating object". The hazard "contact with fixed structure" considers the potential for vessels (including recreational vessels) to contact a fixed structure (e.g. fixed foundation) due to a range of possible causes including poor seamanship, aids to navigation out of position/unlit, or obstruction (e.g. test device) not charted or promulgated. The hazard "contact with floating object" considers the potential for vessels (including recreational vessels) to contact a floating object (e.g. navigation aid or test device) due to a range of possible causes, including an obstruction (e.g. test device) not charted or promulgated, or kayakers or similar making an unauthorised visit. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.1.20 The impact at Dale Roads (site 7) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

East Pickard Bay

12.11.1.21 The maximum design scenario for East Pickard Bay (site 8) is represented by up to two wave device deployments at any one time. The maximum design scenario for spatial extent however is represented by one specific device (Wave Dragon) of up to 147 m in length, 230 m in width and up to 5 m height above sea surface as a maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied. The most likely design scenario is represented by a single floating wave device deployment of up to 80 m in length, 17 m in width and minimal height above/at sea surface. The device would not be active during the installation phase. Each device deployment would be demarked by up to four navigational marker buoys and there may be a Safety Zone around any piling activity required for fixed foundations and temporary advisory clearance distances around installation activities and associated vessels. Installation of single devices at any one time may take place throughout the 15-year consent period.

12.11.1.22 As described in section 12.7.5, the East Pickard Bay (site 8) site is the least intensively used by leisure vessels, with the majority recorded passing through or nearby being on passage. There is potential for kayakers to investigate the installation works at East Pickard Bay (site 8) (see Table 12.3), although this was considered unlikely (see Appendix 12.1: Navigational Risk Assessment (NRA)).

12.11.1.23 This potential impact is considered within the NRA for East Pickard Bay (site 8) under the hazards "contact with fixed structure" and "contact with floating object". The hazard "contact with fixed structure" considers the potential for vessels (including recreational vessels) to contact a fixed structure (e.g. fixed foundation) due to a range of possible causes including poor seamanship, aids to navigation out of position/unlit, or obstruction (e.g. test device) not charted or promulgated. The hazard "contact with floating object" considers the potential for vessels (including recreational vessels) to contact a floating object (e.g. navigation aid or test device) due to a range of possible causes including an obstruction (e.g. test device) not charted or promulgated, or kayakers or similar making an unauthorised visit. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.1.24 The impact at East Pickard Bay (site 8) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

12.11.1.25 MEW will implement an Operational Management Plan (including Emergency Response) which will include a requirement for device-specific risk assessments to be prepared in advance of each specific device deployment to ensure that any risks to leisure users are minimised to ALARP or lower. MEW plans to issue Notices to Mariners directly to a database of known users (including yacht clubs and local activity centres) to notify of device-specific installation activities and any associated temporary advisory clearance distances, and onshore signage (where possible and subject to necessary permissions and appropriateness) may also help mitigate potential interactions between small craft navigators and device deployments (see Table 12.10). These measures will ensure that leisure users are fully aware of the location and nature of the installation activities and can plan accordingly. Any Safety Zones and temporary advisory clearance distances will be designed to provide additional separation distance between the installation activities and leisure users. Other designed-in measures include appropriate navigational marking and use of safety vessels/guard boats during short-term deployments, subject to the results of the device-specific risk assessment.

12.11.1.26 The Warrior Way (site 6) and Dale Roads (site 7) sites are located within the SHA area and are therefore also subject to existing management measures (where relevant) as identified in section 12.7.3. It was also noted during consultation that there is good management and relationships between recreational users and the MHPA which is considered to reduce the vulnerability of the receptor to this impact.

12.11.1.27 The leisure user receptor at Warrior Way (site 6) is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

12.11.1.28 The leisure user receptor at Dale Roads (site 7) and East Pickard Bay (site 8) is deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

12.11.1.29 Overall, for Warrior Way (site 6) the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

12.11.1.30 Overall, for Dale Roads (site 7) and East Pickard Bay (site 8) the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be minor. The effect will therefore be of minor adverse significance, which is not significant in EIA terms.

Future monitoring

12.11.1.31 No Shipping and Navigation monitoring to test the predictions made within the installation phase impact assessment is considered necessary.

12.11.2 Operation and maintenance phase

12.11.2.1 The impacts of the operation and maintenance of the META project have been assessed on Shipping and Navigation. The environmental impacts arising from the operation and maintenance of the META Project are listed in Table 12.7 along with the maximum design scenario against which each operation and maintenance phase impact has been assessed. A conclusion of significance of effect will be made for the META project as a whole, and for each META phase 2 site individually, where appropriate (Warrior Way (site 6), Dale Roads (site 7); East Pickard Bay (site 8)).

12.11.2.2 A description of the potential effect on Shipping and Navigation receptors caused by each identified impact is given below.

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

Magnitude of impact

12.11.2.3 The presence of tidal devices at the Warrior Way (site 6) site and associated operation and maintenance activities may deviate vessel routes leading to a loss of navigable space. The Dale Roads (site 7), and East Pickard Bay (site 8) sites are not located within any regularly used routes for any class of vessel considered (see section 12.7.5) and are therefore not expected to have any impact on vessel routing within the Waterway or approaches (see Appendix 12.1: Navigational Risk Assessment (NRA)).

12.11.2.4 The maximum design scenario at Warrior Way (site 6) is for up to four test devices deployed within a 12-month period with only single devices deployed at any one time. The maximum design scenario is based on a floating device deployment, with up to five vessels making up to 104 visits during daylight hours, wherever possible for operation and maintenance activities in a 12-month period. The most likely design scenario is for up to two test devices deployed within a 12-month period, with up to three vessels making up to 52 visits during daylight hours for operation and maintenance activities in a 12-month period. The maximum footprint of a single device at Warrior Way (site 6) for both the maximum and most likely design scenario has been described in paragraph 12.11.1.4 and is small in the context of the proposed test area. The device will be demarked by up to four navigational marker buoys and any temporary advisory clearance distances around maintenance vessels and activities may extend beyond the device footprints of the respective areas. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 6 months (maximum design scenario) and 3 months (most likely scenario).

12.11.2.5 Vessels transiting in the vicinity of Warrior Way (site 6) in the upper Waterway are most likely to be recreational vessels, high speed craft and tugs/other service vessels (see section 12.7). As described in paragraph 12.11.1.5, the Warrior Way (site 6) site is located in a relatively narrow section of the Waterway and during consultation stakeholders expressed concern that vessels may be deviated to shallower water to the north (see Table 12.3). However, considering that only a small part of the test area would be used at any one time, this will have minimal impact on vessel routing. The impact of any temporary advisory clearance distances would be reversible as these will be removed upon completion of the maintenance activity.

12.11.2.6 This potential impact is considered within the NRA for Warrior Way (site 6) under the hazard “grounding” which considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to ground due to a range of possible causes including unplanned course alteration due to traffic density or position of devices. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable).

12.11.2.7 The impact at Warrior Way (site 6) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

12.11.2.8 It is anticipated that vessels will be able to transit past the Warrior Way (site 6) site during the operation and maintenance phase when a device is deployed in the test site. When a test device is not deployed at site, there will be no restriction of movement within Warrior Way (site 6). The presence of a device and any associated maintenance activities would be communicated in advance via Notices to Mariners as described in Table 12.10, ensuring that vessels can plan their routes accordingly. The Warrior Way (site 6) site is located within the SHA area and is therefore subject to existing traffic management measures (where relevant) as identified in section 12.7.3.

12.11.2.9 The Shipping and Navigation receptor is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore considered to be medium.

Significance of the effect

12.11.2.10 Overall, the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

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)

Magnitude of impact

12.11.2.11 The presence of tidal devices at the Warrior Way (site 6) site, wave devices at the Dale Roads (site 7) and wave devices and floating offshore wind components at East Pickard Bay (site 8) may increase allision risk to vessels not under command and in an emergency situation. For example, 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 for each site in turn below.

Warrior Way

12.11.2.12 The maximum design scenario for Warrior Way (site 6) is represented by a single floating tidal device deployment of up to 25 m in length, 15 m in width, up to 2 m height above sea surface and a 5 m rotor diameter, with up to four test devices deployed within a 12-month period (single device at any one time). The most likely design scenario is represented by a single floating tidal device deployment of up to 5 m in length, 5 m in width, minimal height above/at sea surface and a 5 m rotor diameter, with up to two test devices deployed within a 12-month period (single device at any one time). The maximum footprint of a single device at Warrior Way (site 6) for both the maximum and most likely design scenario has been described in paragraph 12.11.1.4 and is small in the context of the proposed test area. The device will be demarked by up to four navigational marker buoys. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 6 months (maximum design scenario) and 3 months (most likely scenario).

12.11.2.13 As described in section 12.7.5, vessels transiting in the vicinity of Warrior Way (site 6) in the upper Waterway are most likely to be recreational vessels, high speed craft and tugs/other service vessels. Consultation has advised that small craft capsize drills are undertaken in this area and stakeholders expressed concern that unattended small craft could drift into the META test area. As described in section 12.7.7, there were no recorded incidents in the immediate vicinity of the Warrior Way (site 6) site over a period of 20 years although incidents involving leisure craft are unlikely to be represented in MAIB statistics.

12.11.2.14 This potential impact is considered within the NRA for Warrior Way (site 6) under the hazards “contact with fixed structure” and “contact with floating object”. The hazard “contact with fixed structure” considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to contact a fixed structure (e.g. fixed foundation) due to a range of possible causes including machinery or equipment failure. The hazard “contact with floating object” considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to make contact with a floating object (e.g. navigation aid or test device) due to a range of possible causes including machinery or equipment failure. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.2.15 The impact at Warrior Way (site 6) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Dale Roads

12.11.2.16 The maximum design scenario for Dale Roads (site 7) is represented by a single floating wave device deployment of up to 30 m in length, 20 m in width and up to 2 m height above sea surface, with up to two test devices deployed within a 12-month period. The most likely design scenario is represented by a single floating wave device deployment of up to 15 m in length, 10 m in width and height at sea surface, with up to one test device deployed within a 12-month period. Both scenarios are for a single device deployed at any one time. The footprint of a single device may be up to 600 m^2 plus 200 m^2 mooring spread (i.e. 800 m^2) (maximum design scenario), or up to 200 m^2 plus 100 m^2 mooring spread (i.e. 300 m^2) (most likely design scenario). Both are small in the context of the proposed test area. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 12 months (maximum design scenario) and 6 months (most likely design scenario).

12.11.2.17 As described in section 12.7.5, vessels transiting in the vicinity of Dale Roads (site 7) are most likely to be recreational vessels and seasonal sight-seeing passenger vessels, although commercial vessels anchor to the south and the Irish Sea ferry, commercial vessels and tugs/other service vessels also transit to the south of the site. As described in section 12.7.7, there were no recorded incidents in the immediate vicinity of the Dale Roads (site 7) site over a period of 20 years although incidents involving leisure craft are unlikely to be represented in MAIB statistics.

12.11.2.18 This potential impact is considered within the NRA for Dale Roads (site 7) under the hazards "contact with fixed structure" and "contact with floating object". The hazard "contact with fixed structure" considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to contact a fixed structure (e.g. fixed foundation) due to a range of possible causes including machinery or equipment failure. The hazard "contact with floating object" considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to make contact with a floating object (e.g. navigation aid or test device) due to a range of possible causes including machinery or equipment failure. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable).

12.11.2.19 The impact at Dale Roads (site 7) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

East Pickard Bay

12.11.2.20 The maximum design scenario for East Pickard Bay (site 8) is represented by up to two wave device deployments at any one time, with total dimensions of up to 147 m in length, 230 m in width and up to 5 m height above sea surface (however these dimensions are represented by one specific device, Wave Dragon, the largest device included within the Project Design Envelope (PDE) , by a significant margin). A maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied. There may be up to four test devices deployed within a 12-month period (up to two deployments at each berth). The most likely design scenario is represented by a single device deployment of up to 80 m in length, 17 m in width and minimal height above/at sea surface, with up to one test device deployed within a 12-month period. The footprint of up to two devices may be up to 33,910 m^2, plus up to 500,000 m^2 mooring spread (i.e. 533,910 m^2) (maximum design scenario) and the footprint of a single device may be up to 1,700 m^2 plus up to 625 m^2 mooring spread (i.e. 2,325 m^2) (most likely design scenario). Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 18 months (maximum design scenario) and 12 months (most likely design scenario).

12.11.2.21 As described in section 12.7.5, vessels transiting in the vicinity of East Pickard Bay (site 8) are most likely to be recreational vessels, seasonal sight-seeing passenger vessels and high speed craft, although the Irish Sea ferry, commercial vessels and tugs/other service vessels also transit to the west of the site. As described in section 12.7.7, one incident (mechanical failure) was recorded on the north western boundary of the East Pickard Bay (site 8) site over a period of 20 years, with three other incidents recorded in relatively close proximity to this site.

12.11.2.22 This potential impact is considered within the NRA for East Pickard Bay (site 8) under the hazards "contact with fixed structure" and "contact with floating object". The hazard "contact with fixed structure" considers the potential for vessels (passenger, recreational and commercial vessels and tugs/service craft) to contact a fixed structure (e.g. fixed foundation) due to a range of possible causes including machinery or equipment failure. The hazard "contact with floating object" considers the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to make contact with a floating object (e.g. navigation aid or test device) due to a range of possible causes including machinery or equipment failure. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.2.23 The impact at East Pickard Bay (site 8) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

12.11.2.24 There are a number of existing risk control measures within the SHA area which will continue to remain in place during the operation and maintenance of the META test areas (see section 12.7.3). Although East Pickard Bay (site 8) is largely out with the SHA area, the site is very close to the approaches to the Waterway, and all commercial traffic passing close by, or through the proposed site is likely to be subject to pilotage and other port control measures such as passage planning requirements. Other designed-in measures specific to the META project include promulgation of information including Notices to Mariners and onshore signage (where possible and subject to necessary permissions and appropriateness), appropriate navigational marking, charting, use of safety vessels/guard boats during short-term deployments subject to the results of the device-specific risk assessment and the implementation of an Operational Management Plan (including Emergency Response) (see Table 12.10).

12.11.2.25 The Shipping and Navigation receptor at Warrior Way (site 6) is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

12.11.2.26 The Shipping and Navigation receptor at Dale Roads (site 7) is deemed to be of low vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be low.

12.11.2.27 The Shipping and Navigation receptor at East Pickard Bay (site 8) is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of the effect

12.11.2.28 Overall, for Warrior Way (site 6) the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

12.11.2.29 Overall, for Dale Roads (site 7) the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

12.11.2.30 Overall, for East Pickard Bay (site 8) the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Physical presence of devices may reduce under keel clearance

Magnitude of impact

12.11.2.31 The presence of tidal devices at the Warrior Way (site 6) site, wave devices at the Dale Roads (site 7), and wave devices or floating offshore wind components at East Pickard Bay (site 8), and associated moorings, may reduce under keel clearance. At Warrior Way (site 6), there is potential for the devices to occupy all or part of the water column under both the maximum design scenario and the most likely design scenario, with at sea surface components under the most likely design scenario. At Dale Roads (site 7), there is potential for surface-piercing under both scenarios, with at sea surface components under the most likely design scenario. At East Pickard Bay (site 8), there is potential for surface-piercing, at surface and sub-surface components under both scenarios. In the event that the test devices are sub-surface, there is potential for vessels to contact them if under keel clearance is not sufficient.

12.11.2.32 The MCA (MCA, 2014) has provided guidance to developers in determining an appropriate minimum water depth over tidal devices where it is not possible to deviate marine traffic. This guidance states that, where there is no safe and reasonable deviation for marine traffic, under keel clearance must allow for the safe transit of vessels at all states of the tide. In the case of META, each site has been selected in consultation with MHPA to avoid the main shipping activities and navigational risks (see Chapter 3: Need and Alternatives Considered). Each META project device deployed will be demarked by up to four navigational marker buoys and marine traffic will be expected to deviate around this area.

12.11.2.33 The NRA assessed the hazards “contact with fixed structure” and “contact with floating object” for each site, which considered the potential for vessels (including passenger, recreational and commercial vessels and tugs/service craft) to contact a fixed structure (e.g. fixed foundation) or a floating object (e.g. navigation aid or test device) due to a range of possible causes including obstruction not charted or promulgated. Considering a combination of consequence and frequency, the overall risk rating was considered to be low (Acceptable) for each hazard assessed for each site (see paragraphs 12.11.1.15, 12.11.1.19 and 12.11.1.23).

12.11.2.34 The impact at Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

12.11.2.35 Designed-in measures will include Notices to Mariners before and during every device deployment, navigational marker buoys and/or other Aids to Navigation to demarcate testing activities, and consideration of the use of safety vessels/guard boats during short-term deployments subject to the results of the device-specific risk assessment. It is noted that the presence of navigational marker buoys will not prevent vessels from entering the marked area, however it is considered unlikely that mariners will enter the marked areas due to the designed-in measures which will ensure that mariners are aware of the location of the devices.

12.11.2.36 There are also a number of existing risk control measures within the SHA area which will continue to remain in place during the operation and maintenance of the META test areas (see section 12.7.3). Although East Pickard Bay (site 8) is largely out with the SHA area, the site is very close to the approaches to the Waterway, and all commercial traffic passing close by, or through the proposed site is likely to be subject to pilotage and other port control measures such as passage planning requirements.

12.11.2.37 The Shipping and Navigation receptor at Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) is deemed to be of low vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

12.11.2.38 Overall, for Warrior Way (site 6) Dale Roads (site 7) and East Pickard Bay (site 8) the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be negligible. The effect will, therefore, be negligible, which is not significant in EIA terms.

Physical presence of devices may increase risk of gear/anchor snagging

Magnitude of impact

12.11.2.39 The presence of tidal devices at the Warrior Way (site 6) site, wave devices at the Dale Roads (site 7), and wave devices or floating offshore wind components at East Pickard Bay (site 8), and associated moorings, may increase risk of gear/anchor snagging.

Warrior Way

12.11.2.40 The maximum design scenario for Warrior Way (site 6) is represented by a single floating tidal device deployment of up to 25 m in length, 15 m in width, up to 2 m height above sea surface and a 5 m rotor diameter, with up to 150 m^2 mooring spread and there may be up to four test devices deployed within a 12-month period (a single device deployed at any one time). The most likely design scenario is represented by a single floating tidal device deployment of up to 5 m in length, 5 m in width, minimal height above/at sea surface and a 5 m rotor diameter, with up to 75 m^2 mooring spread, and there may be up to two test devices deployed within a 12-month period (a single device deployed at any one time). Each device will be demarked by up to four navigational marker buoys. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 6 months (maximum design scenario) and 3 months (most likely scenario).

12.11.2.41 In terms of the potential for increased risk of fishing gear snagging, as described in section 12.7.5, few fishing vessel tracks were recorded within or in the vicinity of the three test site areas, although potting may take place in all three test site areas. Consultation has advised that there is very little/no commercial fishing vessel activity within the Warrior Way (site 6) site.

12.11.2.42 In terms of the potential for anchor snagging, as described in section 12.7.2 there are no formal anchorage areas in any of the sites, although there are no restrictions on anchoring in any of the sites and leisure vessels may choose to anchor in the shallower waters of Warrior Way (site 6).

12.11.2.43 The impact at Warrior Way (site 6) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Dale Roads

12.11.2.44 The maximum design scenario for Dale Roads (site 7) is represented by a single floating wave device deployment of up to 30 m in length, 20 m in width and up to 2 m height above sea surface, with up to 200 m^2 mooring spread. There may be up to two test devices deployed within a 12-month period with a single device deployed at any one time. The most likely design scenario is represented by a single floating wave device deployment of up to 15 m in length, 10 m in width and height at sea surface, with up to 100 m^2 mooring spread and up to one device deployed within a 12-month period. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 12 months (maximum design scenario) and 6 months (most likely design scenario).

12.11.2.45 In terms of the potential for increased risk of fishing gear snagging, as described in section 12.7.5, few fishing vessel tracks were recorded within or in the vicinity of the three test site areas although potting may take place in all three test site areas. Consultation has indicated a high volume of coastal fishing activity (mostly potting) in the vicinity of the site and that fishing activity is common at Soldier's Rocks on the western side of Lindsway Bay. Indicative fishing grounds that overlap with Dale Roads (site 7) include light otter trawling and beach set nets, with a potting site also located in close proximity to the site. Overall, very few vessels may use the area for fishing grounds.

12.11.2.46 In terms of the potential for anchor snagging, as described in section 12.7.2 there are no formal anchorage areas in any of the sites, with the closest designated anchorage to Dale Roads (site 7) located approximately 0.5 NM to the south. There are no restrictions on anchoring in any of the sites however leisure vessels may choose to anchor in the shallower waters of Dale Roads (site 7).

12.11.2.47 The impact at Dale Roads (site 7) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

East Pickard Bay

12.11.2.48 The maximum design scenario for East Pickard Bay (site 8) is represented by up to two wave device deployments at any one time, with total dimensions of up to 147 m in length, 230 m in width and up to 5 m height above sea surface, with up to 500,000 m^2 mooring spread (however these dimensions are represented by one specific device, Wave Dragon). A maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied. There may be up to four test devices deployed within a 12-month period. The most likely design scenario is represented by a single floating wave device deployment of up to 80 m in length, 17 m in width and minimal height above/at sea surface, with up to 625 m^2 mooring spread (single device) and there may be up to one test device deployed within a 12-month period. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 18 months (maximum design scenario) and 12 months (most likely design scenario).

12.11.2.49 In terms of the potential for increased risk of fishing gear snagging, as described in section 12.7.5, few fishing vessel tracks were recorded within or in the vicinity of the three test site areas although there may be some small-scale inshore fishing to the north of the East Pickard Bay (site 8) site and potting may take place in all three test site areas. Consultation has indicated high shellfish potting activity and some fixed netting along the East Pickard Bay/Angle peninsula coastline. Indicative fishing grounds that overlap with the site include light otter trawling, set nets and potting however overall, fishing vessel activity at this site is considered small in the context of the wider area.

12.11.2.50 In terms of the potential for anchor snagging, as described in section 12.7.2 there are no formal anchorage areas in any of the sites. There are no restrictions on anchoring in any of the sites however it is considered unlikely that any vessel would choose to anchor within the East Pickard Bay (site 8) site, except in an emergency.

12.11.2.51 The impact at East Pickard Bay (site 8) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

12.11.2.52 The presence of the devices at each of the test sites and any associated moorings would be communicated in advance via Notices to Mariners as described in Table 12.10, ensuring that anchoring and fishing activities can be planned accordingly. 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.

12.11.2.53 The Shipping and Navigation receptor is deemed to be of low vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore considered to be low.

Significance of the effect

12.11.2.54 Overall, for Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8), the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be negligible. The effect will, therefore, be negligible, which is not significant in EIA terms.

Physical presence of devices may lead to potential for interaction between leisure users and the device

Magnitude of impact

12.11.2.55 The physical presence of tidal devices at Warrior Way (site 6), wave energy devices at Dale Roads (site 7) and wave devices and floating offshore wind components at East Pickard Bay (site 8) may present potential for interaction between leisure users and the META project activities. For example, consultation identified the potential for kayakers to investigate the devices at East Pickard Bay (site 8) (see Table 12.3), increasing risk of contact with the device, although this was considered unlikely (see Appendix 12.1: Navigational Risk Assessment (NRA)). This potential impact is considered for each site in turn below.

Warrior Way

12.11.2.56 The maximum design scenario for Warrior Way (site 6) is represented by a single floating tidal device deployment of up to 25 m in length, 15 m in width and up to 2 m height above sea surface, with a 5 m rotor diameter moving at up to 5 m/s. There may be up to four test devices deployed within a 12-month period (a single device deployed at any one time). The most likely design scenario is represented by a single floating tidal device deployment of up to 5 m in length, 5 m in width and minimal height above/at sea surface, with a 5 m rotor diameter moving at up to 2 m/s. There may be up to two test devices deployed within a 12-month period (a single device deployed at any one time). Each device would be demarked by up to four navigational marker buoys and there may be temporary advisory clearance distances around maintenance activities and associated vessels. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 6 months (maximum design scenario) and 3 months (most likely scenario).

12.11.2.57 As described in section 12.7.5, the Warrior Way (site 6) site is intensively used for recreational purposes including youth sail training and other activities, and there are likely to be inexperienced leisure users in this area. There is potential for local leisure users to investigate the devices however training activities would be subject to supervision and therefore this is considered to reduce the extent of this impact.

12.11.2.58 This potential impact is considered within the NRA for Warrior Way (site 6) under the hazards "contact with fixed structure" and "contact with floating object" as described in paragraph 12.11.1.15. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.2.59 The impact at Warrior Way (site 6) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Dale Roads

12.11.2.60 The maximum design scenario for Dale Roads (site 7) is represented by a single floating wave device deployment of up to 30 m in length, 20 m in width and up to 2 m height above sea surface. There may be up to two test devices deployed within a 12-month period with a single device deployed at any one time. The most likely design scenario is represented by a single floating wave device deployment of up to 15 m in length, 10 m in width and height at sea surface. There may be up to one device deployed within a 12-month period. Each device would be demarked by up to four navigational marker buoys and there may be temporary advisory clearance distances around maintenance activities and associated vessels. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 12 months (maximum design scenario) and 6 months (most likely design scenario).

12.11.2.61 As described in section 12.7.5, the Dale Roads (site 7) site is a popular leisure area for cruising/passage, with occasional yacht anchoring and power boat training exercises, although the area is less intensively used by leisure vessels than Warrior Way (site 6). There is considered to be low potential for local leisure users to investigate the devices at this site.

12.11.2.62 This potential impact is considered within the NRA for Dale Roads (site 7) under the hazards "contact with fixed structure" and "contact with floating object" as described in paragraph 12.11.1.19. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.2.63 The impact at Dale Roads (site 7) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

East Pickard Bay

12.11.2.64 The maximum design scenario for East Pickard Bay (site 8) is represented by up to two wave device deployments at any one time, with total dimensions of up to 147 m in length, 230 m in width and up to 5 m height above sea surface (however these dimensions are represented by one specific device, Wave Dragon). A maximum scenario height of up to 15 m above sea surface will only apply in devices up to a maximum dimension scenario of 60 m length x 60 m width. Where maximum dimensions of a device are over 60 m length x 60 m width, a maximum height of 5 m above sea surface will be applied. There may be up to four test devices deployed within a 12-month period. The most likely design scenario is represented by a single floating wave device deployment of up to 80 m in length, 17 m in width and minimal height above/at sea surface. There may be up to one test device deployed within a 12-month period. Each device would be demarked by up to four navigational marker buoys and there may be temporary advisory clearance distances around maintenance activities and associated vessels. Operational testing may take place throughout the year over up to 15 years however the maximum duration of deployment activity for any one device will be 18 months (maximum design scenario) and 12 months (most likely design scenario).

12.11.2.65 As described in section 12.7.5, the East Pickard Bay (site 8) site is the least intensively used by leisure vessels, with the majority recorded passing through or nearby being on passage. There is potential for kayakers to investigate the installation works at East Pickard Bay (site 8) (see Table 12.3), although this was considered unlikely (see Appendix 12.1: Navigational Risk Assessment (NRA)).

12.11.2.66 This potential impact is considered within the NRA for East Pickard Bay (site 8) under the hazards "contact with fixed structure" and "contact with floating object" as described in paragraph 12.11.1.23. Considering a combination of consequence and frequency, the overall risk rating was considered to be low for each hazard assessed (Acceptable).

12.11.2.67 The impact at East Pickard Bay (site 8) for both the maximum and most likely design scenario is predicted to be of local spatial extent, long-term duration, intermittent and of high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

12.11.2.68 MEW will implement an Operational Management Plan (including Emergency Response) which will include a requirement for device-specific risk assessments to be prepared in advance of each specific device deployment to ensure that any risks to leisure users are minimised to ALARP or lower. MEW plans to issue Notices to Mariners directly to a database of known users (including yacht clubs and local activity centres) to notify of the presence of the devices and any associated maintenance activities, and onshore signage (where possible and subject to necessary permissions and appropriateness) may also help mitigate potential interactions between small craft navigators and device deployments (see Table 12.10). These measures will ensure that leisure users are fully aware of the location and nature of the devices and can plan accordingly. Temporary advisory clearance distances will be designed to provide additional separation distance between any maintenance activities and leisure users. Other designed-in measures include appropriate navigational marking and use of safety vessels/guard boats during short term deployments subject to the results of the device-specific risk assessment (see Table 12.10).

12.11.2.69 The Warrior Way (site 6) and Dale Roads (site 7) sites are located within the SHA area and are therefore subject to existing management measures (where relevant) as identified in section 12.7.3. It was also noted during consultation that there is good management and relationships between recreational users and the MHPA which is considered to reduce the vulnerability of the receptor to this impact.

12.11.2.70 The leisure user receptor Warrior Way (site 6) is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

12.11.2.71 The leisure user receptor Dale Roads (site 7) and East Pickard Bay (site 8) is deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

12.11.2.72 Overall, for Warrior Way (site 6) the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

12.11.2.73 Overall, for Dale Roads (site 7) and East Pickard Bay (site 8) the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Future monitoring

12.11.2.74 No Shipping and Navigation monitoring to test the predictions made within the operation and maintenance phase impact assessment is considered necessary.

12.11.3 Decommissioning phase

12.11.3.1 The impacts of the decommissioning of the META project have been assessed on Shipping and Navigation. The environmental effects arising from the decommissioning of the META project are listed in Table 12.5 along with the maximum design scenario against which each decommissioning phase impact has been assessed. A conclusion of significance of effect will be made for the META project as a whole, and for each META phase 2 site individually, where appropriate (Warrior Way (site 6), Dale Roads (site 7); East Pickard Bay (site 8)).

12.11.3.2 A description of the potential effect on Shipping and Navigation receptors caused by each identified impact is given below.

Presence of 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

12.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from installation. The significance of effect is therefore minor (adverse) (see paragraph 12.11.1.11) which is not significant in EIA terms.

Presence of decommissioning activities and associated vessels may lead to potential for interaction between leisure users and META activities

12.11.3.4 The effects of decommissioning activities are expected to be the same or similar to the effects from installation. The significance of effect is therefore minor (adverse) (see paragraph 12.11.1.29 and paragraph 12.11.1.30) which is not significant in EIA terms.

Future monitoring

12.11.3.5 No Shipping and Navigation monitoring to test the predictions made within the decommissioning phase impact assessment is considered necessary.

12.12 Cumulative Effect Assessment

12.12.1 Screening of other projects and plans into the Cumulative Impact Assessment

12.12.1.1 The Cumulative Impact Assessment (CIA) takes into account the impact associated with the META project together with other projects and plans. The projects and plans selected as relevant to the CIA presented within this chapter are based upon the results of a screening exercise. Each project has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved. In undertaking the CIA for the META project, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside the META project. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact with the META project (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. Table 12.11 presents the projects that have been considered for inclusion in the META project CIA.

Table 12.11: List of other projects and plans considered within the CEA.

Phase	Developer – Reference	Distance from Warrior Way (km)	Distance from Dale Roads (km)	Distance from East Pickard Bay (km)	Spatial/temporal overlap with the META project	Details	Dates of installation/ deployment	Further Assessment required?	Justification
Dredging sites									
Installation/ operation and maintenance	Neyland Yacht Haven Ltd. - DML1743	1.1	12.3	10.5	No spatial overlap with consented areas. Potential for temporal overlap.	Dredge and disposal from Neyland Marina – annual volume 5,500 m^3.	13/12/2017-12/12/2020	No	Dredging activities are included as part of the topic baseline and this additional project and proposed dredge volume is not considered to materially affect the baseline.
Installation/ operation and maintenance	Milford Haven Port Authority - DML1646	1.3	1.5	2.5	No spatial overlap with consented areas. Potential for temporal overlap.	Maintenance dredging throughout the Milford Haven. Annual volume 362,500 m^3.	09/03/2017-08/03/2022	No	Included as part of the topic baseline and hence not considered within the cumulative impact assessment.
Dredge disposal sites									
Installation/ operation and maintenance	Neyland dredge disposal site - LU190	0.5	12.4	10.5	No spatial overlap with any of the consented areas. Temporal overlap	Location: South of Neyland within the central channel of the Milford Haven, 0.22 NM diameter x 5 m depth. Status: Open	Not applicable	No	Included as part of the topic baseline and hence not considered within the cumulative impact assessment.
Installation/ operation and maintenance	Milford Haven Two dredge disposal site - LU169	26.7	20	15	No spatial overlap with any of the consented areas. No temporal overlap.	Location: To the south of Milford Haven dredge disposal grounds, unknown diameter x 50 m depth. Status: Open	Not applicable	No	Dredge disposal site is located at its closest 15 km from the META project, therefore no physical effect-receptor overlap.
Installation/ operation and maintenance	Milford Haven Three dredge disposal site - LU169	48.9	36	34.7	No spatial overlap with any of the consented areas. No temporal overlap.	Location: To the west of Milford Haven dredge disposal grounds, 1 nm diameter x unknown depth. Status: Open	Not applicable	No	Dredge disposal site is located at its closest 34.7 km from the META project, therefore no physical effect-receptor overlap.
Research									
Installation	Greenlink Interconnector Ltd. - RML1827	10.4	6	0	Spatial overlap with East Pickard Bay (site 8). Temporal overlap with East Pickard Bay.	Ground investigations. ML application submission anticipated Q2 2019.	Works to commence 2019	No	Survey operations are likely to involve vessels with associated equipment however it is considered that there is no potential for cumulative impacts on shipping and navigation receptors with East Pickard Bay (site 8), which is not located within any regularly used routes for any class of vessel considered.
Installation	University College of Swansea - DEML1861	~4-5	~8-9	~6-7	Location is assumed to be by the Pembroke Power station. No spatial overlap with any of the consented areas. Temporal overlap.	Pembroke Power bubble barrier experiment. Investigation into the effectiveness of bubble curtains in sediment management.	Band 2 Marine Licence issued 12/12/2018 - three-year study	No	Screened out due to no physical effect-receptor overlap with the META project.
Installation	University College of Swansea - DEML1845	12.7	5.4	0	Spatial overlap with East Pickard Bay (site 8) No temporal overlap.	Deposition and subsequent removal of marker buoys with environmental monitoring and mid-water settlement plates.	30/08/2018-29/08/2019	No	Screened out due to no temporal overlap with the META sites.
Infrastructure									
Installation/ operation and maintenance	Neyland Yacht Haven Ltd - CML1658	1.1	12.3	10.5	No spatial overlap with consented areas. No temporal overlap.	Pile replacement in Neyland Marina.	21/11/2016-20/11/2019	No	Pile replacement is currently ongoing until 2019, therefore no temporal overlap.
Installation/ operation and maintenance	Mixed use developments - Local	7.3	5.3	5.6	No spatial overlap with any consented areas. Temporal overlap remains	Undetermined planning application. Demolition of several existing buildings and the mixed-use redevelopment of Milford Waterfront comprising up to	EIA screening decision was returned on the	No	Screened out due to distance of the project from the META sites.

Phase	Developer – Reference	Distance from Warrior Way (km)	Distance from Dale Roads (km)	Distance from East Pickard Bay (km)	Spatial/temporal overlap with the META project	Details	Dates of installation/ deployment	Further Assessment required?	Justification
	Planning Authority Reference: 14/0158/PA				unknown due to insufficient information on start and end dates.	26,266 m^2 of commercial, hotel, leisure, retail and fishery related floorspace. Up to 190 residential properties, up to 70 additional marina berths, replacement boat yards, landscaping, public realm enhancements, access and ancillary works. A decision on this application is yet to be made by the local planning authority.	30/04/2018 - no further information has been provided		
Installation/ operation and maintenance / decommissioning	Greenlink Interconnector Ltd. - Government reference: qA1296053	10.4	6	0	Spatial overlap with East Pickard Bay (site 8). Temporal overlap will occur throughout the duration of the META project.	The Project is a 500 MW subsea electricity interconnector linking the power markets in Ireland and Great Britain and is planned for commissioning in 2023. As an EU Project of Common Interest, it is one of Europe's most important energy infrastructure projects. The interconnector is planned to make landfall at Freshwater West beach to the south of the mouth of the Waterway.	2020-2023 (installation)	Yes	There is potential for cumulative impacts on anchor/gear snagging risk with East Pickard Bay (site 8).
Installation/ operation and maintenance / decommissioning	Valero - Welsh Government reference: qA1312073	-	-	-	No overlap with the META project as project is assumed to have no marine components.	Development of a cogeneration facility to supplement electrical power and steam demands of the refinery all within the refinery boundaries on land.	07/12/2017 - Nationally significant project (ongoing)	No	Project is assumed to have no marine elements, therefore no conceptual effect-receptor pathway.
Installation/ operation and maintenance / decommissioning	Bombora Wave Energy	11.6	5.0	0	Spatial overlap with East Pickard Bay (site 8) within META test area. Potential for temporal overlap	Bombora on- and off-shore infrastructure and deployment of Bombora mWave device at East Pickard Bay. This is to include device deployment (mWave device), installation of temporary communications cable between mWave device and temporary onshore control station to be located above East Pickard Bay, and installation and operation of temporary control station onshore. Laying of marine cable to shore and through intertidal area at East Pickard Bay to involve up to 3 days cable laying below MHWS using cable lay vessel and up to four vessels, including guard boat. Cable to be laid on seabed (in sandy sediment) and through natural rock channel (where the marine cable traverses potential reefy habitat) and protected with rock bags. In the intertidal area, the cable will be laid through a natural gully, or up the vertical gully side and attached to the semi-vertical rock face with rock bolts using hand held tools. JCB will pull the cable through the intertidal area from a location above MHWS.	Q1 2020	Yes	There is the potential for cumulative impacts on anchor/gear snagging risk with East Pickard Bay (site 8).
Ministry of Defence sites									
Operation	Ministry of Defence	8.1	5.5	0	No spatial overlap with any consented areas but adjacent to southern boundary of the East Pickard Bay site. Potential for temporal overlap.	The Castlemartin Range is located immediately south of the entrance to the Waterway and extends for up to 12 NM from the coast between Little Furznip (at the southern extent of Freshwater West) and St Govan's Head (Milford Haven Port Authority 2019). The southern boundary of the East Pickard Bay (Site 8) site is located adjacent to the northern boundary of the Castlemartin Military Practice Area D113A. The range at Castlemartin supports the training of military personnel (Army) in the firing of a range of munitions at land-based targets. The seaward danger area provides a safety zone for overfire and shrapnel which may result from the striking of targets (RPS, 2010). The Castlemartin firing times are available on the MOD	Ongoing	No	Included as part of the topic baseline and hence not considered within the cumulative impact assessment.

Phase	Developer Reference	Distance from Warrior Way (km)	Distance from Dale Roads (km)	Distance from East Pickard Bay (km)	Spatial/temporal overlap with the META project	Details	Dates of installation/ deployment	Further Assessment required?	Justification
						website which includes a description of the extent of the seaward danger area.			
Aquaculture projects									
Installation/ operation and maintenance	Tethys Oysters	8.9	5.1	2.6	Temporal overlap.	The oyster farm is located on the eastern side of Angle Bay, whereby oysters are grown in baskets on metal supports. The farm will be serviced from the shore by foot.	Oct 2017 – Oct 2020 (possible renewal of licence)	No	Screened out due to location of project within Angle Bay. No vessel access required.
Installation/ operation and maintenance	Pembrokeshire Scallops	15.3	1.8	3.9	Temporal overlap.	The scallop farm is located within Castlebeach Bay, whereby a system of weighted ropes will be deployed for growing scallops and mix species of native algae. The farm will be serviced by vessels and divers.	Jan 2019 – Q4 2020 (possible renewal of licence)	No	Screened out due to location of the project within Castlebeach Bay. Activities may increase vessel traffic density in the Waterway. Screened out due to existing port traffic management measures, including clear channel marking, proactive VTS traffic management and zoning of the Waterway.
Pembroke Dock Marine Projects									
Installation/ operation and maintenance	Milford Haven Port Authority - SC1810 (Pembroke Dock infrastructure)	2	11.3	8.8	No spatial overlap with consented sites. Potential for temporal overlap.	Pembroke Dock redevelopment. Scoping Report submitted. The intention of the Project is to create a flexible and efficient port-related office, industrial, warehousing and distribution, and ancillary operations infrastructure. This will involve the redevelopment of its existing space to incorporate increased deep-water access, internal and external heavy fabrication areas, construction of MEECE and Education/Skills Facility and the construction of a heavy lift facility.	Q3 2019 – Q3 2023	No	Activities associated with the Pembroke Dock infrastructure redevelopment may deviate vessel routes and increase vessel traffic density in the Waterway. Screened out due to existing port traffic management measures, including clear channel marking, proactive VTS traffic management and zoning of the Waterway.
Installation/ operation and maintenance / decommissioning	Marine Energy Wales - DEML1875	1.7	11.7	9.4	No spatial overlap with any of the consented areas. Potential for temporal overlap.	Marine Energy Test Area – Phase 1. Band 2 Marine Licence application submitted. The Project aims to create pre-consented test areas within the Pembroke Dock area. The test areas will have licensable activities to suit testing of initial stage marine renewable devices. These include testing of non-operating components and subassemblies. No full-scale testing is to be supported within the test areas.	21/04/2019-21/04/2029	Yes	Activities associated with the META Phase 1 sites may reduce under keel clearance. There is the potential for cumulative impacts on under keel clearance with Warrior Way (site 6).
Installation/ operation and maintenance / decommissioning	Wave Hub Ltd. - SC1082	31.4	31.1	25.8	No spatial overlap with any consented areas. Potential for temporal overlap as the projects are linked.	Pembroke Demonstration zone. Scoping Report submitted. The Project entails the development of 90 km^2 of seabed with water depths of approximately 50 m and a wave resource of approximately 19 kW/m; to support the demonstration of wave arrays with a generating capacity of up to 30 MW for each project. Consent for this Project could be achieved in 2022, infrastructure could be built by 2024 and the first technology could be installed in 2025.	Jul-18	No	Screened out due to distance of the project from the META sites.

12.12.1.2 The potential impacts identified for assessment as part of the Shipping and Navigation cumulative impact assessment (CIA) are:

- Cumulative 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) (applicable to East Pickard Bay (site 8) only);
- Cumulative reduced under keel clearance (applicable to Warrior Way (site 6) and East Pickard Bay (site 8) only); and
- Cumulative increased risk of gear/anchor snagging (applicable to East Pickard Bay (site 8) only).

12.13 Cumulative Impact Assessment

12.13.1.1 A description of the significance of cumulative impacts upon Shipping and Navigation receptors arising from each identified impact is given below. As no cumulative impacts are predicted for Dale Roads (site 7) (see Table 12.11), the following assessments consider Warrior Way (site 6) and East Pickard Bay (site 8) only.

Cumulative 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)

Magnitude of impact

12.13.1.2 The installation of wave energy devices and floating offshore wind components at East Pickard Bay (site 8) may increase allision risk to vessels not under command and in an emergency situation. Other projects and plans screened into the assessment in proximity to East Pickard Bay (site 8) include the Bombora Wave Energy project which may also increase allision risk to vessels not under command and in an emergency situation. The Bombora Wave Energy project will include deployment of the mWave device within the East Pickard Bay (site 8) site, with installation likely to take place in Q1/Q2 2020.

12.13.1.3 As described in section 12.7.5, vessels transiting in the vicinity of East Pickard Bay (site 8) are most likely to be recreational vessels, seasonal sight-seeing passenger vessels and high speed craft, although the Irish Sea ferry, commercial vessels and tugs/other service vessels also transit to the west of the site. As described in section 12.7.7, one incident (mechanical failure) was recorded on the north western boundary of the East Pickard Bay (site 8) site over a period of 20 years, with three other incidents recorded in relatively close proximity to this site.

12.13.1.4 The impact is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

12.13.1.5 There are a number of existing risk control measures within the SHA area which will continue to remain in place during the operation and maintenance of the META test areas (see section 12.7.3). Although East Pickard Bay (site 8) is largely out with the SHA area, the site is very close to the approaches to the Waterway, and all commercial traffic passing close by, or through the proposed site is likely to be subject to pilotage and other port control measures such as passage planning requirements. Other designed-in measures specific to the META project include promulgation of information including Notices to Mariners and onshore signage (where possible and subject to necessary permissions and appropriateness), appropriate navigational marking, charting, use of safety vessels/guard boats during short-term deployments subject to the results of the device-specific risk assessment and the implementation of an Operational Management Plan (including Emergency Response) (see Table 12.10).

12.13.1.6 The Shipping and Navigation receptor is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of effect

12.13.1.7 Overall, it is predicted that the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Cumulative reduced under keel clearance

Magnitude of impact

12.13.1.8 The presence of tidal devices at the Warrior Way (site 6) site and wave devices or floating offshore wind components at East Pickard Bay (site 8), and associated moorings, may reduce under keel clearance. Other projects and plans screened into the assessment in proximity to Warrior Way (site 6) include the META Phase 1 sites, which are located further to the west in the vicinity of Pembroke Dock. Other projects and plans screened into the assessment in proximity to East Pickard Bay (site 8) include the Bombora Wave Energy project, which overlaps with the East Pickard Bay (site 8) site. The Bombora Wave Energy project will include deployment of the mWave device, with installation likely to take place in Q1/Q2 2020.

12.13.1.9 MCA guidance (MCA, 2014) specifies that, where there is no safe and reasonable deviation for marine traffic, under keel clearance must allow for the safe transit of vessels at all states of the tide. In the case of META, each site has been selected in consultation with MHPA to avoid the main shipping activities and navigational risks (see Chapter 3: Need and Alternatives Considered) and this also applies to META Phase 1. The Bombora Wave Energy project is also located within the East Pickard Bay (site 8) site. Each META project device deployed will be demarked by up to four navigational marker buoys and marine traffic will be expected to deviate around this area.

12.13.1.10 The impact is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity of receptor

12.13.1.11 Designed-in measures for the META Phase 1 and META Phase 2 sites will include Notices to Mariners before and during every device deployment, navigational marker buoys and/or other Aids to Navigation to demarcate testing activities, and consideration of the use of safety vessels/guard boats during short-term deployments subject to the results of the device-specific risk assessment. It is noted that the presence of navigational marker buoys will not prevent vessels from entering the marked area, however it is considered unlikely that mariners will enter the marked areas due to the designed-in measures which will ensure that mariners are aware of the location of the devices.

12.13.1.12 There are also a number of existing risk control measures within the SHA area which will continue to remain in place during the operation and maintenance of the META test areas (see section 12.7.3). Although East Pickard Bay (site 8) is largely out with the SHA area, the site is very close to the approaches to the Waterway, and all commercial traffic passing close by, or through the proposed site is likely to be subject to pilotage and other port control measures such as passage planning requirements.

12.13.1.13 The Shipping and Navigation receptor is deemed to be of low vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be low.

Significance of effect

12.13.1.14 Overall, it is predicted that the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be negligible, which is not significant in EIA terms.

Cumulative increased risk of gear/anchor snagging

Magnitude of impact

12.13.1.15 The presence of wave devices or floating offshore wind components at East Pickard Bay (site 8), and associated moorings, may increase risk of gear/anchor snagging. Other projects and plans screened into the assessment in proximity to the East Pickard Bay (site 8) site include the Greenlink Interconnector and the Bombora Wave Energy project.

12.13.1.16 The Greenlink Interconnector makes landfall at Freshwater West beach. Installation is anticipated to commence in 2020 and be complete in 2023, with works at the landfall likely to take place over a much shorter period. Installation and presence of the interconnector cable may lead to an increased risk of gear/anchor snagging during installation and/or in the event of any cable exposure. The Bombora Wave Energy project will include deployment of the mWave device within the East Pickard Bay (site 8) site and installation of a surface-laid cable between the mWave device and the shore. Installation is likely to take place in Q1/Q2 2020. Installation and presence of the mWave device and surface-laid cable may lead to an increased risk of gear/anchor snagging.

12.13.1.17 In terms of the potential for fishing gear snagging, as described in section 12.7.5, few fishing vessel tracks were recorded within or in the vicinity of the East Pickard Bay (site 8) site although there may be some small-scale inshore fishing to the north of the site and potting may take place in the site area. Consultation has indicated high shellfish potting activity and some fixed netting along the East Pickard Bay/Angle peninsula coastline. Indicative fishing grounds that overlap with the site include light otter trawling, set nets and potting however overall, fishing vessel activity at this site is considered small in the context of the wider area.

12.13.1.18 In terms of the potential for anchor snagging, as described in section 12.7.2 there are no formal anchorage areas in any of the sites. There are no restrictions on anchoring in any of the sites however it is considered unlikely that any vessel would choose to anchor within the East Pickard Bay (site 8) site, except in an emergency.

12.13.1.19 The impact is predicted to be of local spatial extent, long-term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity of receptor

12.13.1.20 The presence of the META devices and any associated moorings would be communicated in advance via Notices to Mariners as described in Table 12.10, ensuring that any anchoring and fishing activities can be planned accordingly. Other designed-in measures include appropriate navigational marking and charting, which will alert mariners to the presence of the devices. These industry standard measures are also likely to apply to the Greenlink Interconnector project.

12.13.1.21 The Shipping and Navigation receptor is deemed to be of low vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be low.

Significance of effect

12.13.1.22 Overall, it is predicted that the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be negligible, which is not significant in EIA terms.

Future monitoring

12.13.1.23 No Shipping and Navigation monitoring to test the predictions made within the cumulative impact assessment is considered necessary.

12.14 Transboundary effects

12.14.1.1 A screening of transboundary impacts has been carried out and has identified that there is no potential for significant transboundary effects with regard to Shipping and Navigation from the META project upon the interests of other European Economic Area (EEA) States.

12.15 Inter-related effects

12.15.1.1 Inter-related effects are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (installation, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. deviation of vessel routes over the installation, operation and maintenance and decommissioning phases); and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on Shipping and Navigation receptors may interact to produce a different or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

12.15.1.2 A description of the likely inter-related effects arising from the META project on Shipping and Navigation is provided here.

12.15.2 Project lifetime effects

12.15.2.1 The greatest potential for project lifetime effects to occur with respect to Shipping and Navigation is associated with deviated vessel routes and potential for interaction between leisure users and the META activities across the installation, operation and maintenance and decommissioning phases of the META project. Project lifetime effects increase the overall total duration of effects, which remain as long-term. Therefore, 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.

12.15.3 Receptor-led effects

12.15.3.1 It is considered that the greatest potential for receptor led effects across the lifetime of the META project is through the 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. These impacts were assigned a significance of negligible to minor adverse as standalone impacts, and although potential combined impacts may arise (i.e. spatial and temporal overlap of effects on one recreational vessel), it is predicted that this will not be any more significant than the individual impacts in isolation. This is due to the designed-in measures which include Notices to Mariners, appropriate navigational marking, charting, use of safety vessels/guard boats during short-term deployments subject to the results of the device-specific risk assessment and the implementation of an Operational Management Plan (including Emergency Response). As such, these interactions are predicted to be no greater than the individual effects assessed in isolation.

12.16 Conclusion and summary

12.16.1.1 Table 12.12 summarises the assessment of effects on Shipping and Navigation associated with the installation, operation and maintenance, and decommissioning of the META project.

Table 12.12: Summary of potential environment effects, mitigation and monitoring at the META project.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Installation phase							
Presence of installation 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	Promulgation of information including Notices to Mariners	Minor	Medium	Minor (not significant in EIA terms)	None	n/a	None
Presence of installation activities and associated vessels may lead to potential for interaction between leisure users and META activities	Promulgation of information including Notices to Mariners and onshore signage (where possible), Safety Zones and temporary advisory clearance distances, appropriate navigational marking, use of safety vessels/guard boats (subject to the results of the device-specific risk assessment), Operational Management Plan (including Emergency Response)	Warrior Way (site 6) – Minor Dale Roads (site 7) – Minor East Pickard Bay (site 8) - Minor	Warrior Way (site 6) – Medium Dale Roads (site 7) – Low East Pickard Bay (site 8) - Low	Minor (not significant in EIA terms)	None	n/a	None
Operation and maintenance phase							
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	Promulgation of information including Notices to Mariners	Minor	Medium	Minor (not significant in EIA terms)	None	n/a	None
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)	Promulgation of information including Notices to Mariners and onshore signage (where possible), appropriate navigational marking, charting, use of safety vessels/guard boats (subject to the results of the device-specific risk assessment), Operational Management Plan (including Emergency Response)	Warrior Way (site 6) – Minor Dale Roads (site 7) – Minor East Pickard Bay (site 8) - Minor	Warrior Way (site 6) – Medium Dale Roads (site 7) – Low East Pickard Bay (site 8) - Medium	Minor (not significant in EIA terms)	None	n/a	None
Physical presence of devices may reduce under keel clearance	Promulgation of information including Notices to Mariners, navigational marker buoys and/or other Aids to Navigation, use of safety vessels/guard boats (subject to the results of the device-specific risk assessment)	Negligible	Low	Negligible (not significant in EIA terms)	None	n/a	None
Physical presence of devices may increase risk of gear/anchor snagging	Promulgation of information including Notices to Mariners, appropriate navigational marking and charting	Warrior Way (site 6) – Negligible Dale Roads (site 7) – Negligible East Pickard Bay (site 8) – Negligible	Low	Negligible (not significant in EIA terms)	None	n/a	None
Physical presence of devices may lead to potential for interaction between leisure users and the device	Promulgation of information including Notices to Mariners and onshore signage (where possible), temporary advisory clearance distances, appropriate navigational marking, use of safety vessels/guard boats (subject to the results of the device-specific risk assessment), Operational Management Plan (including Emergency Response)	Warrior Way (site 6) – Minor Dale Roads (site 7) – Minor East Pickard Bay (site 8) – Minor	Warrior Way (site 6) – Medium Dale Roads (site 7) – Low East Pickard Bay (site 8) – Low	Minor (not significant in EIA terms)	None	n/a	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Decommissioning phase							
Presence of 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	Promulgation of information including Notices to Mariners	Minor	Medium	Minor (not significant in EIA terms)	None	n/a	None
Presence of decommissioning activities and associated vessels may lead to potential for interaction between leisure users and META activities	Promulgation of information including Notices to Mariners and onshore signage (where possible), Safety Zones and temporary advisory clearance distances, appropriate navigational marking, use of safety vessels/guard boats (subject to the results of the device-specific risk assessment), Operational Management Plan (including Emergency Response)	Warrior Way (site 6) – Minor Dale Roads (site 7) – Minor East Pickard Bay (site 8) - Minor	Warrior Way (site 6) – Medium Dale Roads (site 7) – Low East Pickard Bay (site 8) - Low	Minor (not significant in EIA terms)	None	n/a	None

12.17 References

DECC (2011a) Overarching National Policy Statement for Energy (NPS EN-1). Department of Energy and Climate Change. July 2011. 121pp.

DECC (2011b) National Policy Statement for Renewable Energy Infrastructure (NPS EN-3). Department of Energy and Climate Change. July 2011. 82pp.

HSE and MCA (2017) Regulatory expectations on moorings for floating wind and marine devices, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/640962/Regulatory_expectations_on_mooring_devices_from_HSE_and_MCA.PDF.

International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA AISM) (2013) IALA Recommendation O-139 on the Marking of Man-Made Offshore Structures, Edition 2, December 2013, Available at: https://www.iala-aism.org/product/marking-of-man-made-offshore-structures-o-139/.

International Maritime Organisation (IMO) (2018) Formal Safety Assessment. IMO Circular MSC-MEPC.2/Circ.12/Rev.2, Available at: http://www.imo.org/en/OurWork/safety/safetytopics/pages/formalsafetyassessment.aspx.

MCA (2008) Marine Guidance Note (MGN) 372, Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs, Available at: https://www.gov.uk/government/publications/mgn-372-guidance-to-mariners-operating-in-vicinity-of-uk-oreis.

MCA (2013) Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI), Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/372597/NRA_Methodology_2013.pdf.

MCA (2014) Under Keel Clearance – Policy Paper, Guidance to Developers in Assessing Minimum Water Depth over Tidal Devices, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/373456/Under_Keel_Clearance_paper_May_14_-_FINAL.pdf.

MCA (2016) Marine Guidance Note (MGN) 543, Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response, Available at: https://www.gov.uk/government/publications/mgn-543-mf-safety-of-navigation-offshore-renewable-energy-installations-oreis-uk-navigational-practice-safety-and-emergency-response.

Milford Haven Port Authority (2019) Castlemartin Range, Available at: https://www.milfordmarina.com/castlemartin-range-1/.

Pembrokeshire County Council (2018) Newsroom, 2017 – “A Great Year For Tourism”, Available at: https://www.pembrokeshire.gov.uk/newsroom/2017-and8211-a-great-year-for-tourism.

RYA (2015a) The RYA's Position on Offshore Renewable Energy Developments: Paper 2 (of 4) – Wave Energy, September 2015, Available at: https://www.rya.org.uk/knowledge-advice/offshore-renewables/Pages/wave-energy.aspx.

RYA (2015b) The RYA's Position on Offshore Renewable Energy Developments: Paper 3 (of 4) – Tidal Energy, September 2015, Available at: https://www.rya.org.uk/knowledge-advice/offshore-renewables/Pages/tidal-energy.aspx.