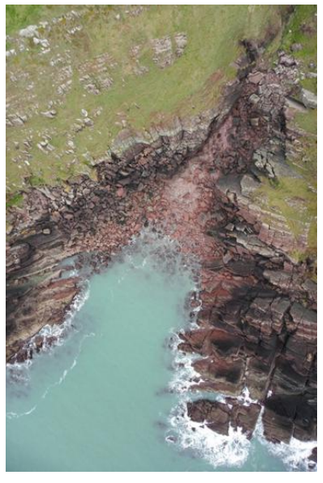
mWave Marine Energy Device and Onshore Infrastructure

ENVIRONMENTAL STATEMENT



June 2019

CHAPTER 12: Shipping and Navigation

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Glossary

Term	Definition
Acoustic Doppler Current Profiler	An Acoustic Doppler Current Profiler (ADCP) is a hydroacoustic current meter similar to sonar, used to measure waves and water current velocities over a range of depth.
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 lightening and/or assistance from another vessel (e.g. tug) or by floating off on the next tide (MCA, 2013).
META project	The META project, located in Pembrokeshire, consists of eight test sites where marine energy testing activities will be permitted.
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
ADCP	Acoustic Doppler Current Profiler
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
RNLI	Royal National Lifeboat Institution
SAR	Search and Rescue
SHA	Statutory Harbour Authority
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 mWave project on Shipping and Navigation. Specifically, this chapter considers the potential impact of the mWave project seaward of Mean High Water Springs (MHWS) during its three phases, namely installation, operational and maintenance, and decommissioning.

12.2 Purpose of this chapter

12.2.1.1 The primary purpose of the Environmental Statement is to support the marine licence application for the mWave project, including the full scale WEC, marine communications cable up to MHWS, Acoustic Doppler Current Profiler (ADCP), Subsea Umbilical Termination Unit (SUTU) and navigational markers (if needed). The Environmental Statement will also support the planning application for the onshore section of the communication cable (from MLW), the termination box, cable anchor point and onshore control station.

12.2.1.2 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 mWave 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 As discussed in Chapter 1 Introduction, the licensing and consenting of the mWave project was originally intended to be undertaken within the consenting and licensing of the Marine Energy Wales META project with mWave being deployed at the eastern end of META Site 8 (East Pickard Bay). Whilst the mWave device is short term and of limited extent compared to the META project, the baseline information for the META Site 8 has been used in the following assessment to ensure consistency of information across the two projects which are likely to be in the consenting process at the same time.

12.3.1.2 The Shipping and Navigation Study Area includes all Shipping and Navigation receptors within an area which has the potential to be affected by the mWave project. The Shipping and Navigation Study Area encompasses the coastal waters off East Pickard Bay (the META Site 8 wider consented area and mWave deployment site), and extends to include the context of the wider Milford Haven Waterway, the port for vessels used in the mWave project (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 mWave 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 mWave 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.

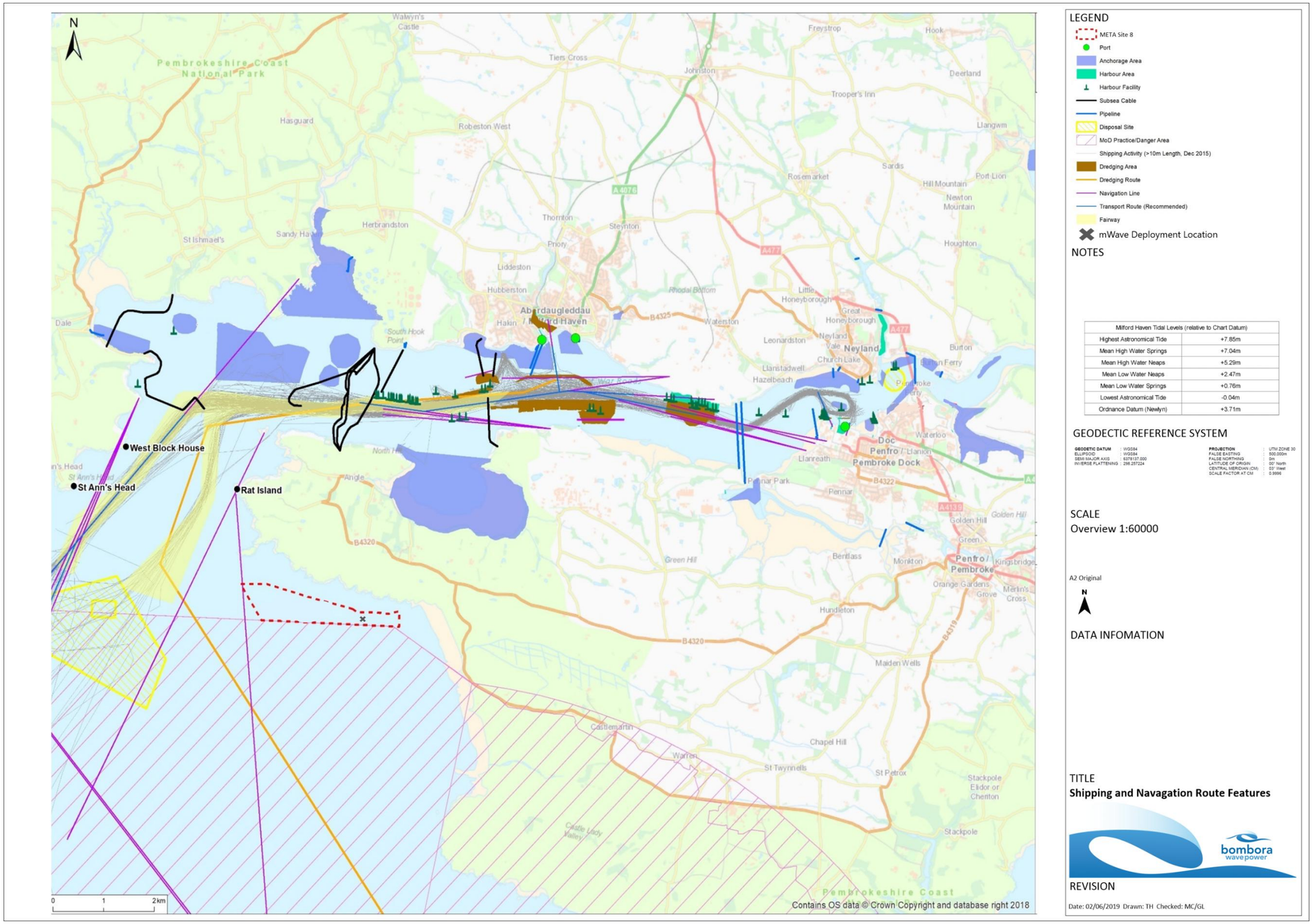


Figure 12-1: Shipping and Navigation Study Area, showing the Waterway and META Site 8 (mWave deployment site) located off East Pickard Bay.

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
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 as part of the META project 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 as part of the META project 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).	As identified above the mWave Project is not an NSIP. The deployment site is away from main shipping areas and the project requires minimal vessel movements throughout its various phases. As such an NRA has not been undertaken for the project. Notwithstanding this an assessment relating to shipping and navigation has been undertaken for the project and the findings are presented in this Chapter.
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 waters off East Picard Bay, 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
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 mWave project will not interfere with recognised sea lanes essential to international navigation, as described in section 12.7.
A Search and Rescue (SAR) Response Assessment should be undertaken prior to commencement of construction (paragraph 2.6.164 of NPS EN-3).	The mWave project will adhere to any requirements set out by regulators with regards to SAR, as described in Table 12-10.
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
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 As identified in 12.3.1.1, the licensing and consenting of the mWave project was originally intended to be undertaken within the consenting and licensing of the Marine Energy Wales META project with mWave being deployed at the eastern end of META Site 8 (East Pickard Bay). As such, consultation on META Site 8 also included the mWave communication cable route and the mWave device. A summary of the key issues raised during consultation specific to Shipping and Navigation, including points raised during the Stakeholder (Navigation) Workshop in January 2019,is outlined below, together with how these issues have been considered in the production of this Environmental Statement chapter.

Table 12-3: Summary of key consultation issues raised during consultation activities undertaken 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.	mWave is a WEC which sits on the seabed and as such there will be no structures on the water surface other than navigational markers, if required. A Notice to Mariners will be issued and a guard boat will be used during mWaves short-term installation/decommissioning and major O&M activities.
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. The mWave deployment site is away from main shipping areas and the project requires minimal vessel movements throughout its various phases. As such an NRA has not been undertaken for the project. Notwithstanding this an assessment relating to shipping and navigation has been undertaken for the project.
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. 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 A 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). 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.	• Potential impacts on navigational issues for commercial and recreational vessels are considered within section 12.11. Cumulative impacts are considered within section 12.13. Visual intrusion is considered in Chapter 14: Seascape, Landscape Assessment, and underwater noise is considered in Chapter 6: Underwater Noise. • A Notice to mariners will be issued to help ensure that interested parties are aware of the presence of mWave and the need to avoid the area during the period of device deployment (see Table 12-10). • A guard boat will be present during mWaves installation/decommissioning and major O&M activities. • As mWave will sit on the seabed with good clearance of water, relative to the vessels that utilise the area, the need for navigational marker buoys will be discussed and agreed with MCA and THLS. • Consultation was carried out with MCA (see below) who confirmed that due to the relatively small spatial extent of the META Site 8 (with mWave being deployed in the eastern area), 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.
18 January 2019	MCA Scoping Response	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	• Potential impacts on navigational issues for commercial and recreational vessels are considered within section 12.11. Visual intrusion is considered in Chapter 14: Seascape,

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		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.	Landscape Assessment, and underwater noise is considered in Chapter 6: Underwater Noise. • A Notice to mariners will be issued to help ensure that interested parties are aware of the presence of mWave and the need to avoid the area during the period of device deployment (see Table 12-10). A guard boat will be present during mWaves installation/decommissioning and major O&M activities. • As mWave will sit on the seabed with good clearance of water, relative to the vessels that utilise the area, the need for navigational marker buoys will be discussed and agreed with MCA and THLS. • Consultation was carried out with MCA (see below) who confirmed that due to the relatively small spatial extent of the META Site 8 (with mWave being deployed in the eastern area), it was 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. • A communications cable will be laid on the surface of the seabed from mWave to East Pickard Bay, a distance of approximately 1.4km. Bathymetry data has confirmed the seabed depths along the cable route and the potential for reduced underkeel clearance is considered within section 12.11. The assessment concludes that there will not be a reduction of greater than 5% in surrounding depths referenced to Chart Datum. • The potential for Safety Zones is considered within Table 12-10. • Bathymetric survey has been undertaken of the mWave deployment area including cable route. As such appropriate information is available to inform the shipping and navigation assessment.
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. • Delays to ferry service due weather and the impact any activity would have with this project.	Potential impacts on passenger vessels are considered within section 12.11.
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	As mWave will sit on the seabed with good clearance of water, relative to the vessels that utilise the area, the need for navigational marker buoys will be discussed and agreed with MCA and THLS.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		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.	
30 January 2019	Stakeholder (Navigation) Workshop	META Site 8 East Pickard Bay • 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 off East Pickard Bay 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 (Navigation) Workshop	Other general points raised: • Potential for reduced underkeel clearance	Potential for reduced underkeel clearance is considered within section 12.11.
3 March 2019	MHPA	Tow plan required for moving mWave to site, to include safety arrangements around pilot embarkment and disembarkment. Confirmed that there is not much flexibility with ferry vessel movements.	Tow plan will be prepared for review by MHPA.

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.

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, any assessment 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 mWave project, given the scale and location of the test site 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 and the surrounding area covering the following winter and summer periods:

- 01 to 28 February 2018
- 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 META held a stakeholder workshop in January 2019 with a number of key navigation stakeholders including MHPA and other commercial and recreational operators within the Waterway and the surrounding area, to gain local knowledge and insight on navigation. A summary of the key points raised with respect to the waters off East Pickard Bay 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.

12.7.2 Navigational Features

12.7.2.1 The mWave deployment sites is situated approximately 3km to the southeast of the entrance to 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 the waters off East Pickard Bay. Although there are no restrictions on anchoring in the waters off East Pickard Bay, the area is unlikely to be used by commercial vessels, which tend to anchor in the deeper waters off St Brides bay to the north of the Waterway. This is likely to be due to the extent of Castlemartin Military Practice Area, which is discussed later on. It is considered unlikely that any vessel would choose to anchor off East Pickard Bay, 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 Neyland Bridge (see Figure 12-1).

12.7.2.5 There are no existing marine renewable energy installations within East Pickard Bay or wider Waterway. There are no operational subsea cables or pipelines charted in the immediate vicinity of East Pickard Bay, though bathymetric survey (Titan 2018) showed evidence of disused cables in the area. The Castlemartin Military Practice Area D113A is located to the 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). The Practice area boundary is about 100m to the south of mWave deployment site. The gunnery ranges at Castlemartin are active for up to 44 weeks in the year, starting in late February and ending in mid-December (MHPA, 2017). 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. The Waterway is 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 Neyland Bridge. The mWave deployment site is outside the Milford Haven Statutory Harbour Authority (SHA) area and therefore MHPA has no statutory duty or powers to direct traffic within this and the majority of the surrounding area. However, the site is close to the approaches to the Waterway, and all commercial traffic passing close by 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.

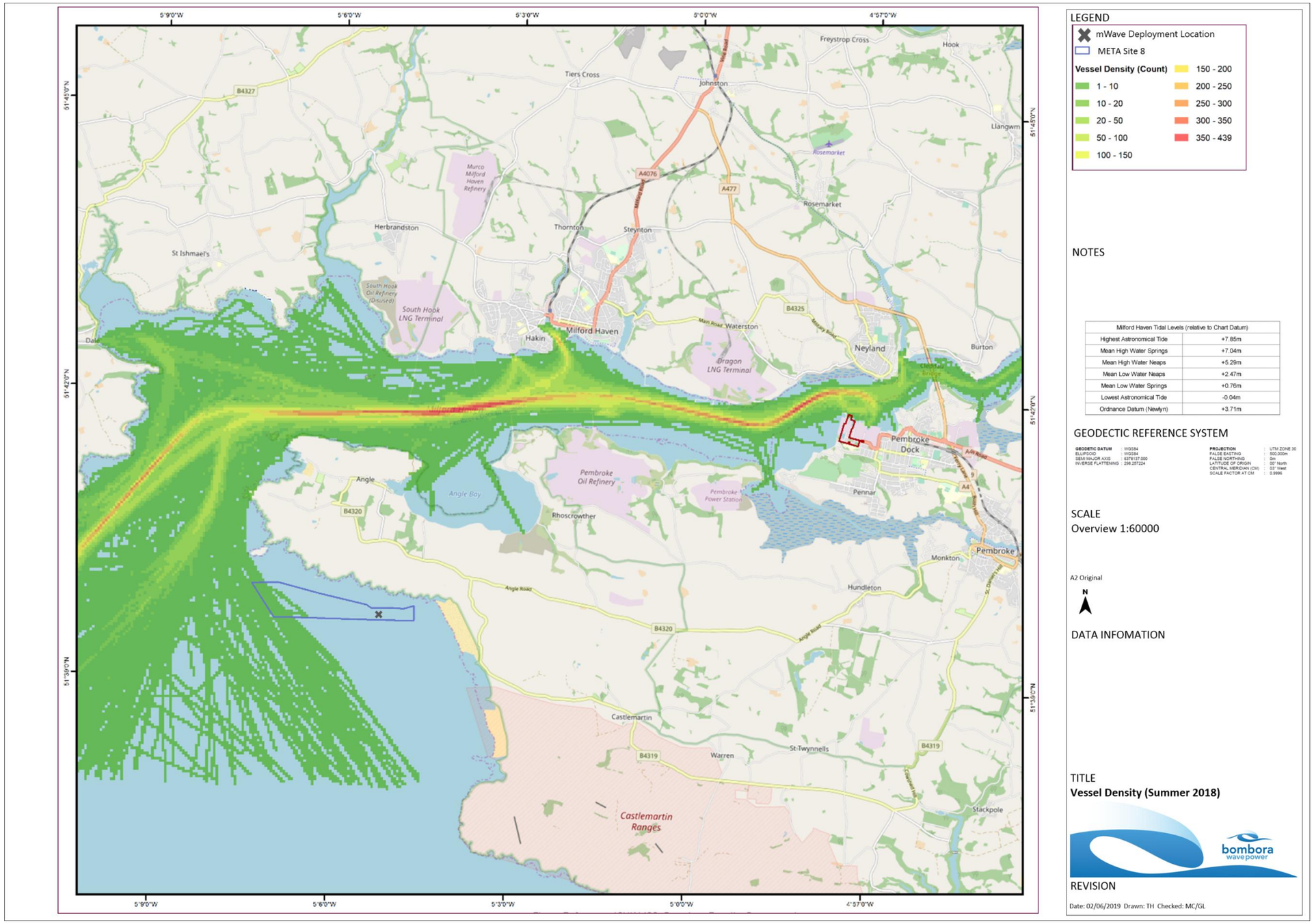
12.7.4 MetOcean Conditions

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.

12.7.4.2 The Waterway is very sheltered, especially from the prevailing south-westerly winds. However, the waters off East Pickard Bay, are very exposed to the prevailing south-westerly weather conditions, hence it is an excellent site for surfing.

12.7.5 Existing Vessel Traffic

12.7.5.1 As discussed previously mWave will be located in the eastern area of META Site 8. Vessels used in the mWave project are likely to operate from Pembroke Dock/Milford Haven. Figure 12-2 and Figure 12-3 present an overview of AIS reported vessel traffic within the Waterway and the waters off East Pickard Bay during the summer and winter of 2018 respectively. The boundary of META Site 8 is shown on the figures as a point of reference and mWave will be deployed approximately 2.2km from its western boundary and 0.5km from its eastern boundary.



LEGEND

mWave Deployment Location

META Site 8

Vessel Density (Count)

1 - 10	150 - 200
10 - 20	200 - 250
20 - 50	250 - 300
50 - 100	300 - 350
100 - 150	350 - 439

NOTES

Milford Haven Tidal Levels (relative to Chart Datum)	
Highest Astronomical Tide	+7.85m
Mean High Water Springs	+7.04m
Mean High Water Neaps	+5.29m
Mean Low Water Neaps	+2.47m
Mean Low Water Springs	+0.76m
Lowest Astronomical Tide	-0.04m
Ordnance Datum (Newlyn)	+3.71m

GEODECTIC REFERENCE SYSTEM

GEODETIC DATUM	: WGS84	PROJECTION	: UTM ZONE 30
ELLIPSOID	: WGS84	FALSE EASTING	: 500,000m
SEMI MAJOR AXIS	: 6378137.000	FALSE NORTHING	: 0m
INVERSE FLATTENING	: 298.257224	LATITUDE OF ORIGIN	: 00° North
		CENTRAL MERIDIAN (CM)	: 03° West
		SCALE FACTOR AT CM	: 0.9996

SCALE
Overview 1:60000

A2 Original

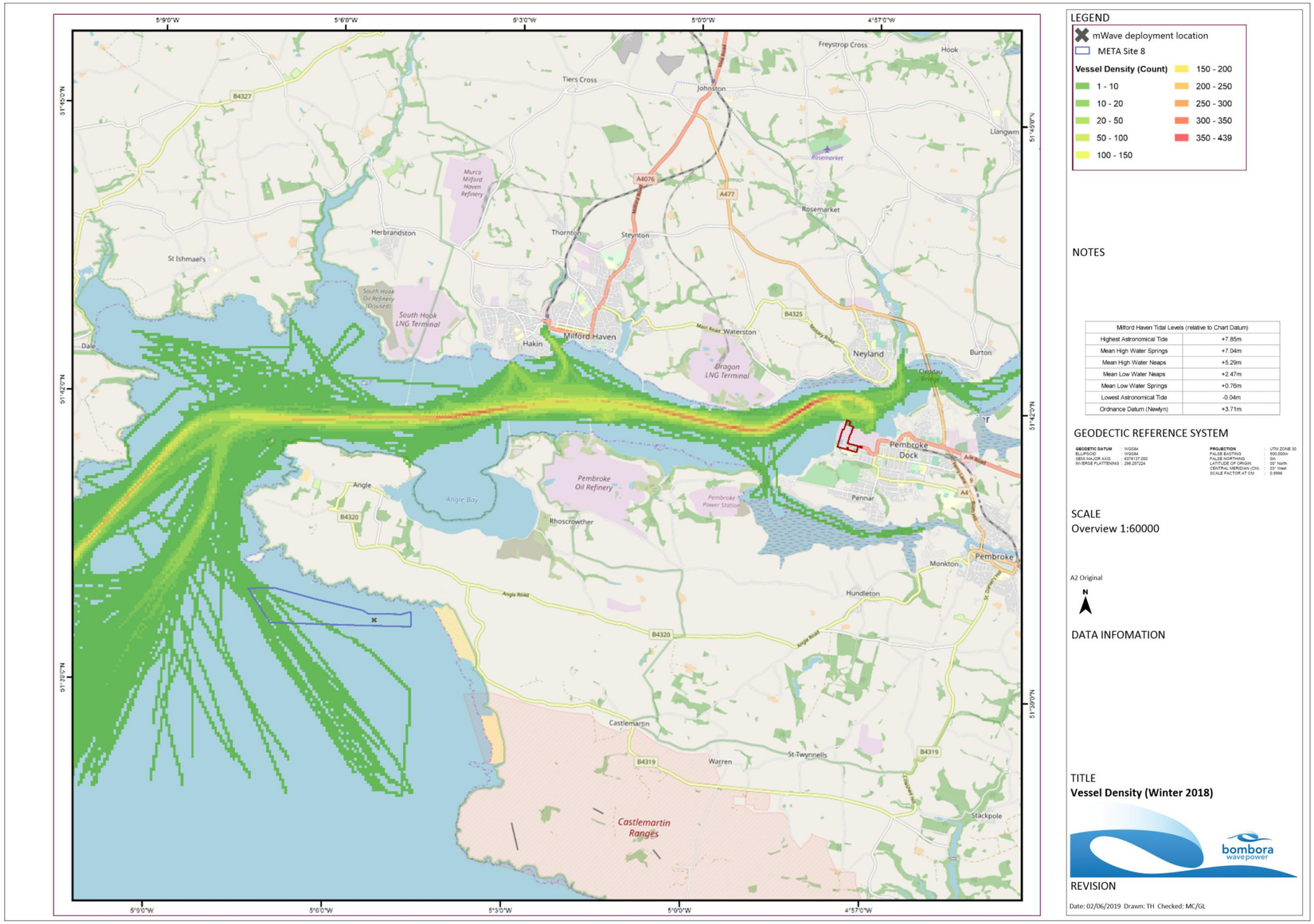
N

DATA INFOMATION

TITLE
Vessel Density (Summer 2018)

REVISION
Date: 02/06/2019 Drawn: TH Checked: MC/GL

12.7.5.2 **Figure 12-2: AIS reported vessel traffic density within the Waterway and East Pickard Bay area (summer 2018).**



LEGEND

- mWave deployment location
- META Site 8

Vessel Density (Count)

1 - 10	150 - 200
10 - 20	200 - 250
20 - 50	250 - 300
50 - 100	300 - 350
100 - 150	350 - 439

NOTES

Milford Haven Tidal Levels (relative to Chart Datum)	
Highest Astronomical Tide	+7.85m
Mean High Water Springs	+7.04m
Mean High Water Neaps	+5.29m
Mean Low Water Neaps	+2.47m
Mean Low Water Springs	+0.76m
Lowest Astronomical Tide	-0.04m
Ordnance Datum (Newlyn)	+3.71m

GEODETIC REFERENCE SYSTEM

GEODETIC DATUM	: WGS84	PROJECTION	: UTM ZONE 30
ELLIPSOID	: WGS84	FALSE EASTING	: 500,000m
SEMI MAJOR AXIS	: 6378137.000	FALSE NORTHING	: 0m
INVERSE FLATTENING	: 298.257224	LATITUDE OF ORIGIN	: 00° North
		CENTRAL MERIDIAN (CM)	: 03° West
		SCALE FACTOR AT CM	: 0.9996

SCALE
Overview 1:60000

A2 Original

N

DATA INFOMATION

TITLE
Vessel Density (Winter 2018)

REVISION
Date: 02/06/2019 Drawn: TH Checked: MC/GL

Figure 12-3: AIS reported vessel traffic density within the Waterway and East Pickard Bay area (winter).

12.7.5.3 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.

12.7.5.4 More area of the Waterway and its approaches are used in the summer by those vessels transmitting AIS data than is the case during the winter. The vessels approaching from or leaving to the south generally take a route around Sheep Island and then across the outer extent of East Pickard Bay/Freshwater West Bay to Linney head. Consultation has advised that leisure traffic is very seasonal in nature (predominantly summer months) while commercial traffic is relatively consistent throughout the year.

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. AIS vessel track plots for each vessel type at each site (summer and winter) is provided.

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 west of East Pickard Bay (see Figure 12-4), with no evidence of interaction with the mWave deployment area.

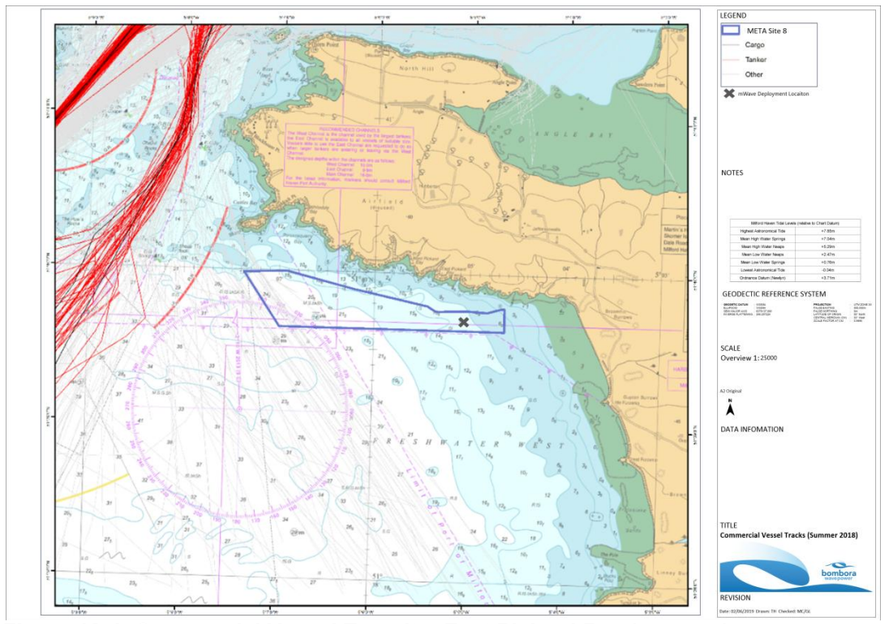


Figure 12-4: Commercial Vessel Transits: East Pickard Bay (summer).

Passenger Vessel Activity

12.7.5.7 The majority of passenger ferry tracks recorded to the west of East Pickard Bay are represented by the Irish Sea ferry, which routinely makes two departures/arrivals per day from Pembroke Dock. The ferries route to/from the Waterway heads around Sheep Island, the most westerly prominent, before transiting across the outer extent of Freshwater West Bay to Linney Head, which form the southerly extent of the Bay. Other passenger ferry tracks (likely to include seasonal sight-seeing trips) were recorded in the vicinity of East Pickard Bay, notably during the summer, however few tracks were recorded passing approximately 2km to the west of the mWave deployment location Figure 12-5

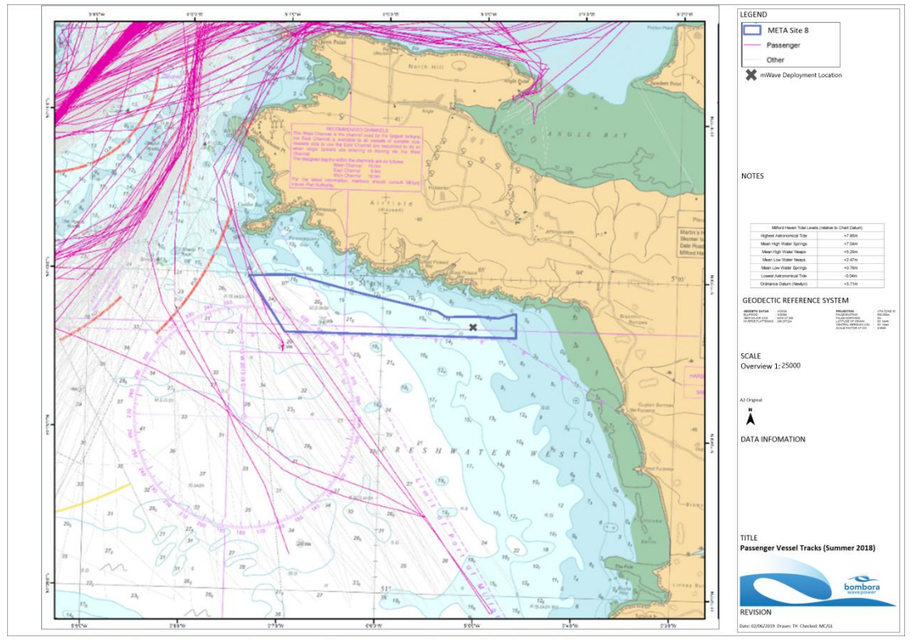


Figure 12-5: Passenger Vessel Transits: East Pickard Bay (winter).

Fishing Vessel Activity

12.7.5.8 Few fishing vessel tracks were recorded within or in the vicinity of the East Pickard Bay. Tracks were mainly recorded passing from Milford Haven Docks to sea, with no evidence of active fishing (Figure 12-6). This aligns with feedback from stakeholder consultation, although there may be some small-scale inshore fishing (from vessels without AIS) along the East Pickard Bay coastline, and potting may also take place.

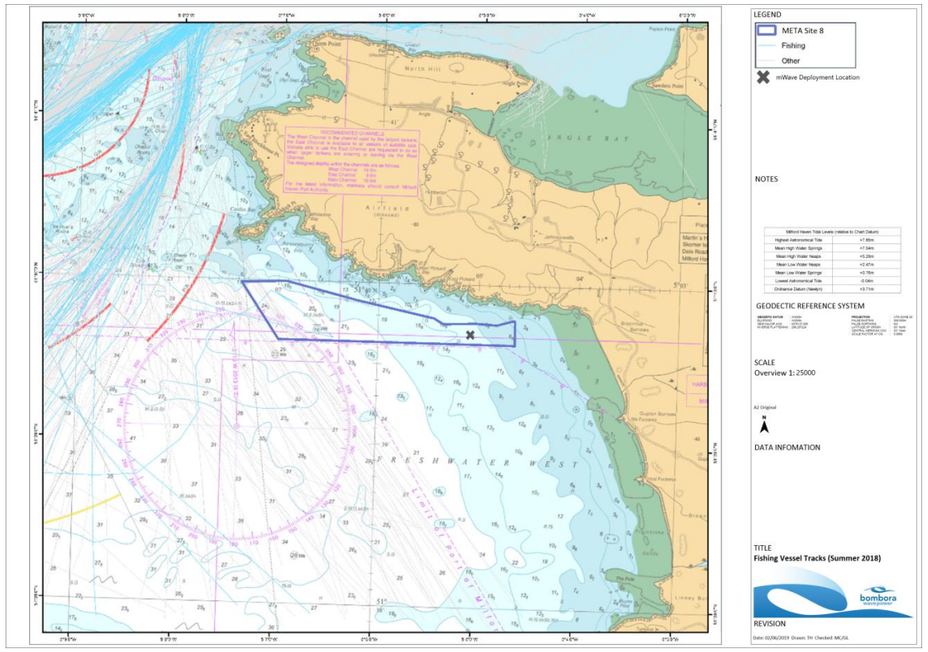


Figure 12-6: Fishing Vessel Transits: East Pickard Bay (summer).

12.7.5.9 Chapter 11: Commercial Fisheries also describes the commercial fisheries baseline for East Pickard Bay. In summary, 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 Whilst the Waterway is an important and well used area for water-based leisure activities, which are well regulated through zones by MHPA in conjunction with the Pembrokeshire Coast National Park Authority (PCNPA), the waters off East Pickard Bay is outside this zoning scheme. Stakeholder consultation has confirmed that this the waters off East Pickard Bay are much less intensively used by leisure vessels than within the Waterway, although Freshwater West Beach is popular for watersports.

12.7.5.11 As most leisure vessels are unlikely to transmit AIS data, the AIS data has been combined with consultation feedback to examine the baseline environment off East Pickard Bay.

12.7.5.12 The AIS data shows that the tracks are mainly transited by leisure vessels on passage. Very few tracks were recorded passing through the area in the summer, with vessels using a similar route to that recorded for passenger ferries (para 12.7.5.6). The closest tracks recorded were passing some 2km from mWave deployment site (see Figure 12-7). No tracks were recorded in the East Pickard Bay area in the winter.

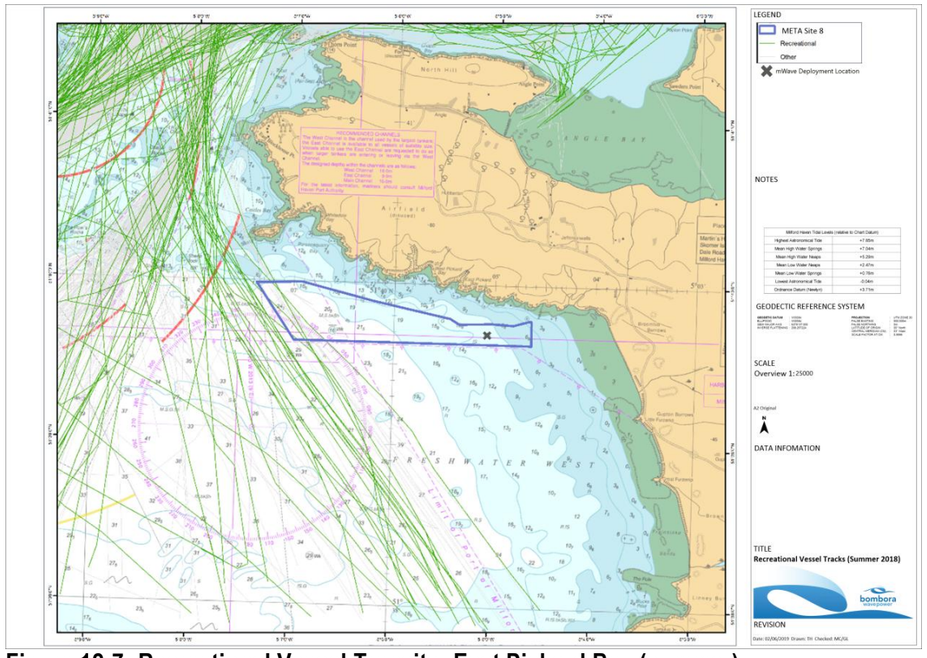


Figure 12-7: Recreational Vessel Transits: East Pickard Bay (summer).

High Speed Craft

12.7.5.13 High-speed craft (likely to be commercial vessels) were recorded in both the summer and winter AIS datasets. These were generally recorded on passage. Once again the navigational route of these vessels avoid the main Freshwater West Bay and pass offshore between Sheep Island and Linney Head. As with ferries and recreational vessels, the tracks were recorded some 2km from the mWave deployment location in both seasons (see Figure 12-8).

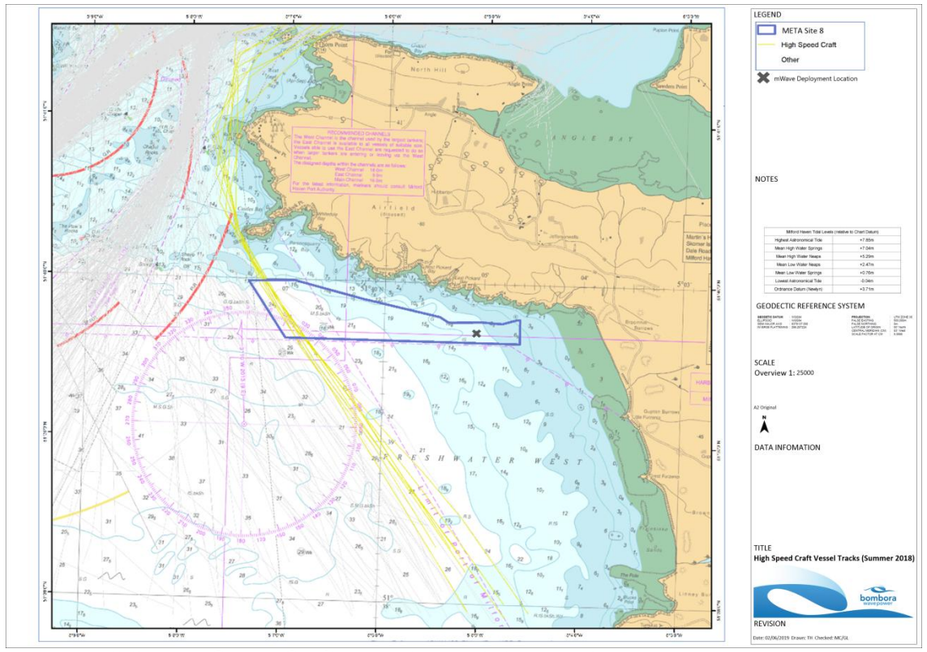


Figure 12-8: High Speed Craft Transits: East Pickard Bay (summer).

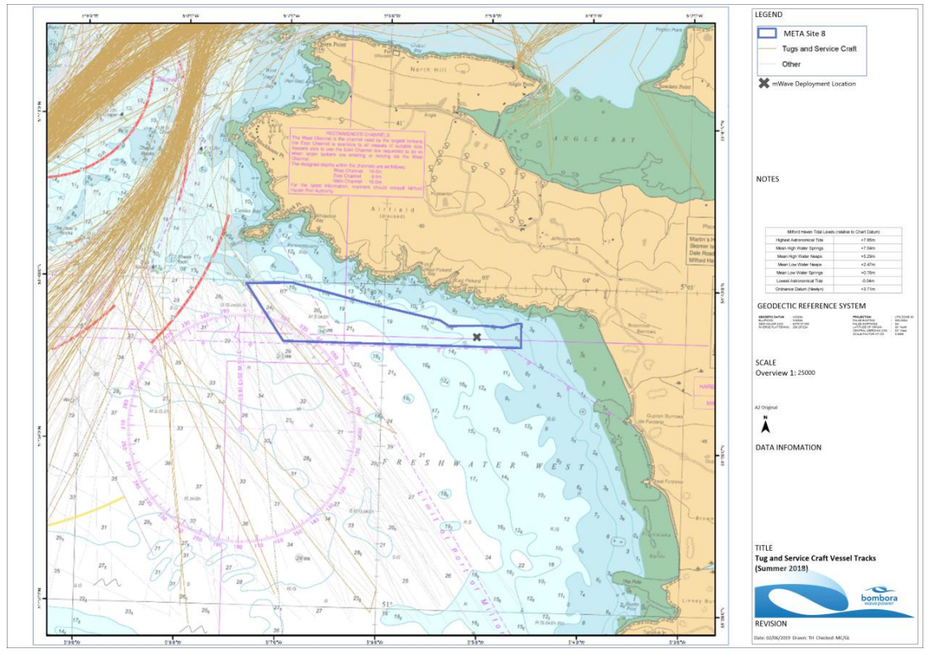


Figure 12-9: Tug and Service Vessel Transits: East Pickard Bay (summer).

Tugs and Other Service Vessels

12.7.5.14 Tugs and other services vessels were rarely recorded in either season. Tracks were recorded passing to the west of Freshwater West Bay between Sheep Island and Linney Head (see Figure 12-9).

12.7.6 Search and Rescue

12.7.6.1 Royal National Lifeboat Institution (RNLI) lifeboats are stationed at Angle at the western extent of the Angle peninsula. 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 approximately 0.6km to the south east of Sheep Island and 2km from mWave deployment site. Three other incidents were recorded in relatively close proximity, either closer to Sheep Island or further west and more distant from mWaves deployment site.

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 mWave 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 future baseline scenario for recreational activities off East Pickard Bay is considered unlikely to change substantially from that presented in section 12.7.5 in the absence of the mWave 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

12.8.1.1 The design (from Chapter 2: Project Description) identified in Table 12-5 have been selected as those most likely to have the potential to result in the greatest effect on an identified receptor or receptor group.

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

- Fish and Shellfish (Chapter 8);
- Marine Mammals (Chapter 9);
- Marine Ornithology (Chapter 10);
- Commercial Fisheries (Chapter 11); and
- Other Users (Chapter 15).

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.

Table 12-5: Design parameters considered for the assessment of potential impacts on Shipping and Navigation.

Potential impact	Design parameter	Justification
Installation phase		
Presence of installation activities and associated vessels may lead to potential for interaction between leisure users and mWave activities	• Up to 3 vessels required for deployment, including guard boat, restricted to daylight hours. • Vessel size - up to 50m in length and 6 m draught. 3 days for mWave installation • Pre-installed moorings. Mooring spread up to 40,000 m^2 • Cable laying one vessel (50m max length, 6m draught) - installation up to 3 days. • Installation of chain ballast - approx. 14 vessel trips over 5 days (26m max length, 2.5m draught). • mWave dimensions 75 m length, 17 m width and 7 m height above seabed, leaving minimum 4.2m clearance at MLWS, 7.35m mid tide and 10.5m at MHWS. • 200m advisory clearance distance around installation activities.	Maximum dimensions and characteristics of WEC and greatest level of activity over the longest duration.
Operational phase		
Physical presence of device and O&M vessels 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)	• Full-scale WEC device testing deployed on the seabed, and scour protection if needed (10 vessel trips over 5 days). • Testing 6 - 12 months. Device sits on seabed with gravity foundation. The need for navigational marker buoys will be agreed with MCA and TLHS. • Area required for mWave device: up to 1900m^2 (comprising seabed footprint, scour protection, communication cable, SUTU and ADCP). • mWave dimensions 75 m length, 17 m width and 7m height above sea bed, leaving minimum 4.2m clearance at MLWS, 7.35m mid tide and 10.5m at MHWS. • 1.4km of marine communication cable 150mm dimension laid on the seabed, with four rock bags to secure at approx. 200m intervals across route. Rock gullies and channels used to secure cable in coastal area. • Up to 76 vessel movements/round trips to and from port, comprising visit once per month for 2 day period with up to 3 vessels, associated with O&M over a maximum 12 month period. • Guard boat present during O&M activities. • 200m advisory clearance distance around major O&M activities.	Maximum dimensions and characteristics of WEC and greatest level of activity over the longest duration.
Physical presence of device may reduce under keel clearance	As above	As above
Physical presence of device may increase risk of gear/anchor snagging	As above	As above
Physical presence of device may lead to potential for interaction between leisure users and the device	As above	As above
Decommissioning phase		
Presence of decommissioning activities and associated vessels may lead to potential for interaction between leisure users and mWave activities	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 decommissioning phases	
Physical presence of device may displace vessels leading to increased vessel to vessel collision risk	As described in section 12.7.5, the majority of shipping passes across the western extent of Freshwater West Bay/East Pickard Bay some 2km to the west of mWave deployment site. The vessels which may use the waters off East Pickard Bay are most likely to be recreational vessels and fishermen potting along the coast. As such the presence of mWave will not affect any routine vessel routes, and therefore will not increase the risk of collision due to increase density of vessels. A Notice to Mariners will be issued for the mWave project and navigational marker will be provided, if required, which will ensure that mariners are aware of the location of the WEC and can plan accordingly. This impact has therefore been scoped out of further assessment.
Physical presence of device may increase vessel to structure allision risk	mWave will sit on the seabed up to a height of 7m, with a minimum of 4.2m water clearance. The vessels likely to be present in the area are smaller recreation craft or small fishing vessels and as such there should be sufficient water clearance above the device at all states of the tide. There will be no surface structure other than navigational markers, if required. It is therefore considered that the potential for the physical presence of mWave to increase the risk of vessel to structure allision can be scoped out of the assessment. A Notice to Mariners and appropriate navigational marking, if required, which will ensure that mariners are aware of the location of the devices and can plan accordingly. This impact has therefore been scoped out of further assessment.
Installation and maintenance activities and physical presence of device may increase risk of grounding at East Pickard Bay	mWave will be deployed approximately 2km from recorded vessel routes, which includes passenger ferries and commercial shipping. For smaller vessels which may be in the area such as fishermen or recreational vessels, the mWave deployment site is a small in extent (75m by 17m) and will have a minimum of 4.2m clearance of water at MLW. As such overall risks from the presence of mWave are likely to be insignificant. This impact has therefore been scoped out of further assessment.
Physical presence of device and associated operations may reduce SAR and pollution response capabilities	Due to the location of mWave deployment site, its small spatial extent and short duration of deployment (maximum 18 months), there is not expected to be any impact on SAR and emergency response. This impact has therefore been scoped out of further assessment.
The mWave device may result in interference with communications, radar and positioning systems	mWave will sit on the seabed. No impacts are anticipated on communications, radar or positioning systems from the operation of the mWave device. This impact has therefore been scoped out of further assessment.
Potential for device breakout due to mooring failure leading to hazard to navigation	mWave will sit on the seabed being secured in place through the use of a gravity foundation which will penetrate into the sand by up to 1m. The level of penetration of the foundation in the seabed will be monitored with the use of an underwater camera. In addition to this chain ballast will be placed within trays on the device. As such there is no potential for mWave to 'breakout'. 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 Impact assessment criteria

12.9.2.1 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.

12.9.2.2 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.

12.9.2.3 The criteria for defining sensitivity in this chapter are outlined in Table 12-8 below.

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.

12.9.2.4 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.

12.9.2.5 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.

		Magnitude of impact				
Sensitivity of receptor		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 mWave 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 mWave 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 mWave project.

Measures adopted as part of the mWave project	Justification
Promulgation of information including a Notice to Mariners issued before device deployment, advising on the location, timings and other relevant information..	Notice to mariners will be issued to help ensure interested parties are aware of the presence of infrastructure and the need to avoid the area during the period of deployment.
Navigational marker buoys will be deployed as directed MCA and THLS, if required.	Bombora will liaise MCA and THLS to ensure the mWave device is appropriately marked for navigational safety.
Subject to agreement from PCNPA an information board could be provided at Freshwater West Beach	If in agreement with PCNPA, information on the project could be provided at Freshwater West beach. Details of planned operational activities could be posted in advance of works.
Works undertaken in good sea conditions.	All offshore works will be undertaken in good sea conditions which with good visibility thereby reducing the potential for incidents.
Advisory clearance distances of 200m will be recommended around vessels undertaking installation/decommissioning and major O&M activities.	Advisory clearance distances are recommended in the interests of navigational safety.
Bombora will use a guard boat during the short-term installation/decommissioning and O&M activities of mWave device.	To ensure other traffic does not encroach on the woks activity.
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.
Tow plan for mWave installation.	A tow plan will be prepared and submitted to MHPA for approval .

12.11 Assessment of significance

12.11.1 Installation phase

12.11.1.1 The impacts of the installation of the mWave project have been assessed on Shipping and Navigation. The potential impacts arising from the installation of the mWave project are listed in Table 12-5, against which each installation phase impact has been assessed. 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 lead to potential for interaction between leisure users and mWave activities

Magnitude of impact

12.11.1.2 The installation of mWave and its communication cable at East Pickard Bay may present potential for interaction between leisure users and installation activities. Six temporary moorings will be pre-installed on site before installation commences. The mWave device is 75 m in length, 17 m in width and 7m high and it has four membrane covered cells . These membrane covered cells will be filled with air to provide buoyancy, so that mWave can be towed to site on the surface by two installation vessels, with a guard boat. Once on site cells at one end will be slowly deflated to allow that end of mWave to sink to the seabed. Once in place the process will be repeated with the other end. There will be a temporary advisory clearance distance of 200m around installation activities and associated vessels. Installation of mWave would take 3 days. Ballast chain will be brought to site and placed in trays on the mWave device. It will take approximately 14 trips over 5 days to deliver the ballast. Laying of the communication cable will use one vessel over three days. The marine section of cable will commence being laid on the seabed surface at the landfall at East Pickard Bay. The end of the cable will be attached to a wire onshore, and pulled into the intertidal area. Once the cable is onshore and secure the cable laying vessel head offshore, laying the cable on the seabed to the mWave device.

12.11.1.3 As described in section 12.7.5, the waters off East Pickard Bay has a low use by leisure vessels, with the majority recorded passing some 2km to the west on passage. There is potential for kayakers to investigate the installation works at East Pickard Bay (see Table 12-3), although this was considered unlikely and the presence of a guard boat would discourage this practice.

12.11.1.4 The impact for mWave and associated marine cable at East Pickard Bay is predicted to be of local spatial extent, short-term duration 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

12.11.1.5 A Notice to Mariners will be issued to notify of installation activities. Signage onshore at Freshwater West Beach may also help mitigate potential interactions between small craft navigators and device deployment (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. A 200m temporary advisory clearance distance will provide additional separation distance between the installation activities and any leisure users. Other designed-in measures include use of a guard boat during deployment.

12.11.1.6 The leisure user receptor at East Pickard Bay 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

12.11.1.7 Overall, for the mWave project 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

12.11.1.8

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

12.11.2 Operational and maintenance phase

12.11.2.1 The impacts of the operation and maintenance of the mWave project have been assessed on Shipping and Navigation. The environmental impacts arising from the operation and maintenance of the mWave project are listed in Table 12-7 against which each operation and maintenance phase impact has been assessed.

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 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

12.11.2.3 The presence of mWave within the water column may increase allision risk to vessels not under command and in an emergency situation. Incidents of mechanical failure have been reported in the vicinity of East Pickard Bay.

12.11.2.4 Whilst mWave will sit on the seabed, at 11m below chart datum, it will occupy 7m of the water column. At low water on a spring tide there would be a 4.2m clearance above mWave, whilst at mid tide there will be 7.35 and at high water 10.5m. The mWave will be 75 m in length and 17 m in width, and it will be deployed for up to 18 months.

12.11.2.5 As described in section 12.7.5, vessels transiting in the vicinity of East Pickard Bay are most likely to be recreational vessels, seasonal sight-seeing passenger vessels and high speed craft, with the Irish Sea ferry, commercial vessels and tugs/other service vessels also transiting to the west of the site. These vessels tend to transit across the outer extent of Freshwater West Bay between Sheep Island and Linney Head, some 2km from the mWave deployment site. As described in section 12.7.7, one incident (mechanical failure) was recorded approximately 0.6km to the south east of Sheep Island over a period of 20 years, with three other incidents either closer to Sheep Island or further west.

12.11.2.6 The impact for mWave at East Pickard is predicted to be of local spatial extent, short-term duration 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

12.11.2.7 Although the waters off East Pickard Bay are largely out with the SHA area, all commercial traffic passing close by or to the west of the mWave site is likely to be subject to pilotage and other port control measures such as passage planning requirements. In addition to this the main shipping transit route is some 2km from the mWave deployment site. Other designed-in measures specific to the mWave project include promulgation of information including Notice to Mariner and possible onshore signage (in agreement with PCNPA). Navigational marking, if required would be agreed with MCA and TLHS (see Table 12-10).

12.11.2.8 The Shipping and Navigation receptor for the waters off East Pickard Bay 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

12.11.2.9 Overall, for the mWave project 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

12.11.2.10 The presence of mWave and its communication cable may reduce under keel clearance and as such there is potential for vessels to contact them if under keel clearance is not sufficient.

12.11.2.11 The MCA (MCA, 2014) has provided guidance to developers in determining an appropriate minimum water depth above 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 addition to this, through consultation the MCA noted that particular attention should be paid to cabling routes. 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. The MCA noted that this will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase.

12.11.2.12 As identified in the baseline assessment very limited large vessel traffic use the East Pickard Bay area for transiting, with the closest AIS tracks running across the outer extent of Freshwater West Bay between Sheep Island and Linney Head, some 2km from the mWave deployment site.

12.11.2.13 The mWave's device is approximately 75m by 17m with a height of 7m above the seabed. The mWave's deployment site is on sand at approximately 415m from MLWS at a depth of around 11m bcd. As such there will be a minimum of 4.2m water clearance at MLWS and ample room to pass by inshore or offshore of the device. The ACPD monitoring device and SUTU will be located within close proximity and will sit less than 1m off the seabed.

12.11.2.14 As identified above, the main transit routes for larger vessels using AIS is some 2km to the west of the site. With regard to incidents (section 12.7.7), the location of these tend to reflect the main vessel transit routes. As such it is anticipated that the most likely vessels in the vicinity of mWave will be smaller recreational vessels or fishing vessels potting for crustacean with keels of 2m or less, or crafts such as kayaks. As such, the minimum clearance above mWave at MLWS will be sufficient to allow these vessels to pass overhead. Consultation will be undertaken with MCA and TLHS to ascertain the need for navigational marker buoys.

12.11.2.15 The communications cable (150mm diameter) will be laid on the surface of the seabed from mWave to East Pickard Bay to the west, a distance of approximately 1.4km. The bathymetry from mWave deployment site towards the west gently drops down from 11m bcd to around 16m bcd (Titan 2018). The substrate in the vicinity of mWave is sand, and the coastal rocky shore at East Pickard Bay extends down to around 16m bcd.

12.11.2.16 The cable will be laid on the seabed through the rocky subtidal section in the natural gully, and this will maintain its position and provide protection.. For the cable based on minimum depth of 11m bcd a 5% reduction in sounding would be 0.55m. The cable is 0.15m diameter and as such would not reduce the depth by more than 5% along any of the sandy section of the cable route. On the sandy substrate, up to four rock bags will be required at approximately 200m intervals to maintain the cable's position. The first rock bag will be deployed approximately 200m to the west of the mWave device a depth of 13m bcd. A further two rock bags will be at a deeper depth, with the fourth bag being installed close to the shore end of the cable. The rock bags will be selected to ensure that the reduction in depth is less than 5% of the surrounding depth.

12.11.2.17 The impact for the cable route and mWave device off East Pickard Bay is predicted to be of local spatial extent, short-term duration 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

12.11.2.18 As identified previously, vessels which are likely to be present in the vicinity of mWave will have a keel of less than 2m and a minimum of 4.2m water clearance above the device. In terms of the communication cable the reduction in sounding depth will be less than 5% of the sounding depth. In addition to this, designed-in measures will include a Notice to Mariners before device deployment, navigational marker buoy if required, and the use of safety guard boat during short-term deployment.

12.11.2.19 Finally, although the waters off East Pickard Bay are largely out with the SHA area, the area is very close to the approaches to the Waterway, and all commercial traffic passing close by, is likely to be subject to pilotage and other port control measures such as passage planning requirements.

12.11.2.20 The Shipping and Navigation receptor off East Pickard Bay 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

12.11.2.21 Overall, for the waters off East Pickard Bay 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

12.11.2.22 The presence of mWave, the ADCP, SUTU and the communication cable at East Pickard Bay, may increase risk of gear/anchor snagging.

12.11.2.23 As identified above the mWave's device is approximately 75m by 17m with a height of 7m, with a minimum of 4.2m water clearance. The ADCP monitoring device and SUTU will be located within close proximity and will sit approximately 1m off the seabed. The mWave deployment site is flat featureless sand. The marine cable will be laid on the seabed, across sandy substrate near to the device and then across the rock coastal region near to the landfall.

12.11.2.24 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 the vicinity of the mWave site although consultation has indicated shellfish potting activity and some fixed netting does occur 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 in this area is considered small in the context of the wider area.

12.11.2.25 In terms of the potential for anchor snagging, as described in section 12.7.2 there are no formal anchorage areas off East Pickard Bay. And although there are no restrictions on anchoring here, it is considered unlikely that any vessel would choose to anchor in the vicinity of mWave, except in an emergency.

12.11.2.26 The impact for the mWave project is predicted to be of local spatial extent, short-term duration 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

12.11.2.27 The presence of the mWave, the ADCP, SUTU and cable would be communicated in advance via a Notice to Mariners as described in Table 12-10, ensuring that anchoring and fishing activities can be planned accordingly. Other designed-in measures include onshore signage, in agreement with PCNPA, and navigational markers if required by MCA and TLHS.

12.11.2.28 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

12.11.2.29 Overall, for the mWave project, 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

12.11.2.30 The physical presence of mWave at East Pickard Bay may present potential for interaction between leisure users and the project activities. For example, consultation identified the potential for kayakers to investigate the activities at East Pickard Bay (see Table 12-3), increasing risk of contact with the device).

12.11.2.31 As mWave is a seabed WEC and as such, once deployed, there will be no structures on the water surface other than navigational markers, if required. As such there will be no visible device for recreational users to interact with. The cable will make landfall at East Pickard Bay approximately 1.5km from the western extent of Freshwater West Beach, the main recreational area. A notice to mariners will be issued, to help ensure that interested parties are aware of the presence of mWave and the need to avoid the area during the period of device deployment (see Table 12-10). A guard boat will be used during short-term installation/decommissioning activities. Operational testing will be for about 6 - 12 months with the device in the water for up to 18 months.

12.11.2.32 As described in section 12.7.5, the waters off East Pickard Bay are not intensively used by leisure vessels, with the majority recorded passing about 2km to the west on passage. There is potential for kayakers from Freshwater West Beach to investigate the installation works off East Pickard Bay (see Table 12-3), although a guard boat would discourage this during mWave installation/decommissioning or major O&M activities.

12.11.2.33 The impact for mWave project at East Pickard Bay is predicted to be of local spatial extent, short-term duration 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

12.11.2.34 As the device sits on the seabed the potential for interaction with recreational users is minimal. A notice to Mariners will be issued and onshore signage at Freshwater West Bay (in agreement with PCNPA) may also help mitigate potential interactions between small craft navigators and mWave activity (see Table 12-10). These measures will ensure that leisure users are aware of the location and nature of mWave and can plan accordingly. (see Table 12-10).

12.11.2.35 The leisure user receptor for the waters off East Pickard Bay 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

12.11.2.36 Overall, 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

12.11.2.37 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 mWave project have been assessed on Shipping and Navigation. The environmental effects arising from the decommissioning of the mWave project are listed in Table 12-5 against which each decommissioning phase impact has been assessed. 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 lead to potential for interaction between leisure users and mWave activities

12.11.3.2 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 12.11.1.7) which is not significant in EIA terms.

Future monitoring

12.11.3.3

12.11.3.4 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 mWave 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.

12.12.1.2 In undertaking the CIA for the mWave 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 mWave project. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are unlikely to contribute to such an impact, due to the short duration of the mWave project (18 months). Table 12-11 presents the projects that have been considered for inclusion in the mWave project CIA.

Table 12-11: List of other projects and plans considered within the CIA.

Project phase	Developer - Reference	Approx. distance to mWave (km)	Spatial/ temporal overlap with the mWave project	Details	Date of Construction	Further Consideration required?	Justification
Dredging sites							
Installation/ Operation and Maintenance	Neyland Yacht Haven ltd. - DML1743	11.5	No spatial overlap. Potential for temporal overlap.	Dredge and disposal from Neyland Marina - annual volume 5500 m^3.	13/12/2017-12/12/2020	No	Dredging impact forms part of baseline and mWave project has no dredging or disposal associated with it. Distant from mWave and therefore highly unlikely to have any impact overlap. No further consideration .
Installation/ Operation and Maintenance	Milford Haven Port Authority - DML1646	4.5	No spatial overlap Potential for temporal overlap.	Maintenance dredging throughout the Milford Haven. Annual volume 362500 m^3.	09/03/2017-08/03/2022	No	Dredging impact forms part of baseline and mWave project has no dredging or disposal associated with it. Distant from mWave project and therefore highly unlikely to have any impact overlap. No further consideration.
Dredge disposal sites							
Installation/ Operation and Maintenance	Neyland dredge disposal site - LU190	11.5	No spatial overlap. Potential for 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	Disposal impact forms part of baseline and mWave project has no dredging or disposal associated with it. Distant from mWave project and therefore highly unlikely to have any impact overlap. No further consideration.
Installation/ Operation and Maintenance	Milford Haven dredge disposal site - LU170	5	No spatial overlap. No temporal overlap as site is closed.	Location: South of St Ann's Head at the mouth of the Milford Haven estuary, unknown diameter x 30 m depth. Status: Closed	Not applicable	No	Dredge disposal site is not in use therefore no further consideration required.
Installation/ Operation and Maintenance	St Ann's Head dredge disposal site - LU180	5	No spatial overlap. No temporal overlap as site is closed	Location: Within the Milford Haven dredge disposal site, unknown diameter x 30 m depth. Status: Closed	Not applicable	No	Dredge disposal site is not in use therefore no further consideration required.
Installation/ Operation and Maintenance	Milford Haven Two dredge disposal site - LU169	16	No spatial overlap No temporal overlap.	Location: To the south of Milford Haven dredge disposal grounds, unknown diameter x 50 m depth. Status: Open		No	Dredge disposal site is located approximately 16 km from the mWave project. Disposal impact forms part of baseline and mWave project has no dredging or disposal associated with it. It is therefore highly unlikely to have any impact overlap. No further consideration.
Installation/ Operation and Maintenance	Milford Haven Three dredge disposal site - LU169	37	No spatial overlap No temporal overlap.	Location: To the west of Milford Haven dredge disposal grounds, 1 nm diameter x unknown depth. Status: Open		No	Dredge disposal site is located at its closest 37 km from the mWave project, Disposal impact forms part of baseline and mWave project has no dredging or disposal associated with it. Project is highly unlikely to have any impact overlap. No further consideration.
Research							
Installation	Greenlink Interconnector Ltd. - RML1827	0	Potential spatial overlap Temporal overlap	Ground investigations		Yes	Research operations are likely to have vessels present, with equipment for undertaking ground truthing surveys therefore this project cannot be excluded from further consideration in the CIA.
Installation	University College of Swansea - DEML1861	7	Location is assumed to be by the Pembroke Power station. No spatial overlap. Temporal overlap.	Pembroke Power bubble barrier experiment Investigation into the effectiveness of bubble curtains in sediment management	07-2018 - no end date given Band 2 licence issued 12/12/2018 - three-year study	No	Distant from mWave project and therefore highly unlikely to have any impact overlap. No further consideration.
Installation	University College of Swansea - DEML1845	1.5	Potential spatial overlap Temporal overlap	Deposition and subsequent removal of marker buoys with environmental monitoring and mid-water settlement plates.	30/08/2018-29/08/2019	No	Vessels and equipment will be required for the placement of marker buoys. Whilst the ML is currently valid, it is unlikely to have temporal with mWave activities, as ML finishes in August 2019. No further consideration.
Installation/ Operation and	Neyland Yacht Haven Ltd	11.5	No spatial overlap.	Pile replacement in Neyland Marina.	21/11/2016-20/11/2019	No	Pile replacement is currently ongoing until 2019, which

Project phase	Developer - Reference	Approx. distance to mWave (km)	Spatial/ temporal overlap with the mWave project	Details	Date of Construction	Further Consideration required?	Justification
Maintenance	- CML1658		No temporal overlap.				does not overlap with the installation and operational phases of mWave. Given the distance from mWave project it is therefore highly unlikely to have any impact overlap. No further consideration
Installation/ Operation and Maintenance	Mixed use developments - Local Planning Authority Reference: 14/0158/PA	10	No spatial overlap. Temporal overlap remains unknown.	Undetermined planning application. Demolition of several existing buildings and the mixed-use redevelopment of Milford Waterfront comprising up to 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.	EIA screening decision was returned on the 30/04/2018 - no further information has been provided	No	Given the distance from mWave project it is therefore highly unlikely to have any impact overlap. No further consideration.
Installation/ Operation and Maintenance/ Decommissioning	Greenlink Interconnector Ltd. - Government reference: qA1296053	0	Spatial overlap at edge of deployment area. Temporal overlap	The Project is a 500MW 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 Fresh Water West beach	07/2018 - ongoing	Yes	Given potential for temporal and spatial overlap with mWave this project cannot be excluded from further consideration in the CIA.
Installation/ Operation and Maintenance/ Decommissioning	Valereo - Welsh Government reference: qA1312073		No overlap with the mWave project. Onshore is remote from mWave control station site.	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 to the project. Onshore is remote from mWave control station site (inner face of Haven), therefore there will be no impact overlap. No further consideration.
Installation/ Operation and Maintenance	EGNEDOL Wales Ltd	N/A	Potential temporal overlap	EGNEDOL propose to create an environmentally sustainable centre of excellence in Milford Haven, at the Waterston and Blackbridge sites. The proposal includes providing business units and refurbishing a jetty to serve as a primary supply link to the EGNEDOL electricity generation plan, and for export of products. The land-based green energy scheme may generate up to 350 MW.	Not available	No	Planning permission for the EGNEDOL project was refused on 19/10/2018, therefore it is considered highly unlikely that this project will overlap temporally with the mWave project. No further consideration.
Ministry of Defence sites							
	Ministry of Defence	0.1	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 Range is used every day of the week and on some weekends (RPS, 2010).	Not applicable	Yes	There is a high level of uncertainty as to timing of MOD activities at the MOD site, however on-going activity is likely therefore there is the potential for cumulative impacts with the mWave project.
Aquaculture projects							
Installation/ Operation and Maintenance	Tethys Oysters	3	Temporal overlap	The oyster farm is located on the eastern side of Angle Bay, whereby oysters are grown in baskets on	Oct 2017 – Oct 2020 (possible renewal of	No	Whilst there is potential for temporal overlap with the mWave project, it is distant and therefore highly unlikely to

Project phase	Developer - Reference	Approx. distance to mWave (km)	Spatial/ temporal overlap with the mWave project	Details	Date of Construction	Further Consideration required?	Justification
				metal supports. The farm will be serviced from the shore by foot	licence)		have any impact overlap. No further consideration.
Installation/ Maintenance Operation and	Pembrokeshire Scallops	6.5	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	Whilst there is potential for temporal overlap with the mWave project, it is distant and therefore highly unlikely to have any impact overlap. No further consideration.
Pembroke Dock Marine Projects							
Installation/ Maintenance Operation and	Milford Haven Port Authority - SC1810: Pembroke Dock Infrastructure	10	No spatial overlap. 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	Port activity as a result of Pembroke Dock Port operations is distant and therefore highly unlikely to have any impact overlap. No further consideration.
Installation/ Maintenance Operation and	META Project, Site 8	0	Spatial overlap Temporal overlap will occur throughout the duration of the mWave project	The META project will allow the deployment and testing of marine renewable devices in the waters off East Pickard Bay. The maximum scenario is for up to two devices at Site 8. An assessment of the maximum META project design has been undertaken in the ES supporting the consents.	In consenting	Yes	Given potential for temporal and spatial overlap with mWave this project cannot be excluded from further consideration in the CIA
Installation/ Operation and Maintenance/Decommissioning	Marine Energy Wales - DEML1875	9.4	No spatial overlap Potential for temporal overlap	Marine Energy Test Area - Phase 1 Band 2 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 support within the test areas	21/04/2019-21/04/2029	No	Project is distant and therefore highly unlikely to have any impact overlap. No further consideration.
Installation/ Operation and Maintenance/Decommissioning	Wave Hub Ltd. - SC1082	20	No spatial overlap No temporal overlap	Demonstration zone Scoping Report submitted. The Project entails the development of 90 km2 of seabed with water depths of approximately 50 metres and a wave resource of approximately 19 kW/m; to support the demonstration of wave arrays with a generating capacity of up to 30MW 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.	2024	No	No temporal overlap with the mWave project. No further consideration.

12.12.1.3 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);
- Cumulative reduced under keel clearance; and
- Cumulative increased risk of gear/anchor snagging.

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.

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 mWave and associated components (ADCP, SUTU and communication cable) 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 mWave includes META Site 8 project which may also increase allision risk to vessels not under command and in an emergency situation. The META Site 8 project will include deployment of up to two wave energy devices, either subsurface or floating, within META Site 8 off East Pickard Bay, with mWave being the deployment located in the eastern end of the site. Installation is likely to take place in Q3/Q4 2020 and the project will be operational for 15 years. The Greenlink cable installation and the META Site 8 installation is unlikely to overlap with the mWave works due to the short timescale of the latter.

12.13.1.3 In addition to this, as described in section 12.7.5, vessels transiting in the vicinity of East Pickard Bay 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 2km to the west of mWaves site. The transit lines cross the western extent of Site 8 and as described in section 12.7.7, one incident (mechanical failure) was recorded in this area, which was on the north western boundary of the META Site 8 over a recording 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, short-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 Although META 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. Like the mWave project other designed-in measures specific to the META project will be incorporated to ensure navigational safety.

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 mWave and the deployment of up to two wave energy devices, either subsurface or floating, and associated moorings, within META Site 8 at East Pickard Bay, may reduce under keel clearance in localised areas. The Greenlink connector cable will be buried and as such will not affect the keel clearance.

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 Site 8, the site was selected in consultation with MHPA to avoid the main shipping activities and navigational risks. Each META site 8 device deployed, over the project lifetime, 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, short-term duration (due to mWaves short deployment), 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 The META Site 8 will include a range of mitigation the final details of which will be determined through their consenting process. In addition to this although META 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.

12.13.1.12 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

12.13.1.13 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

12.13.1.14 The presence of subsea or floating wave devices and associated moorings, at META Site 8 in conjunction with mWave project, may increase risk of gear/anchor snagging. In addition to this, the Greenlink Interconnector makes landfall at Freshwater West beach. Installation of this 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.

12.13.1.15 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 mWave and META Site 8 projects although there may be some small-scale inshore fishing to the north and potting may take place along the coast. 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 META Site 8 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.

12.13.1.16 In terms of the potential for anchor snagging, as described in section 12.7.2 there are no formal anchorage areas in the area. There are also no restrictions on anchoring, however it is considered unlikely that any vessel would choose to anchor within the mWave or META Site 8 area, except in an emergency.

12.13.1.17 The impact is predicted to be of local spatial extent, short-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

12.13.1.18 The presence of the mWave device and the META Site 8 devices, and any associated moorings, would be communicated in advance via Notices to Mariners, ensuring that any anchoring and fishing activities can be planned accordingly. Other measures include appropriate navigational marking, which will alert mariners to the presence of the devices. These industry standard measures are also likely to apply to the Greenlink Interconnector project.

12.13.1.19 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

12.13.1.20 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

12.13.1.21 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 mWave 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, operational 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, operational 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 mWave project on Shipping and Navigation is provided here.

12.15.2 Project lifetime effects

12.15.2.1 No potential project lifetime effects are predicted to occur with respect to Shipping and Navigation as mWave is of short duration (18 months) and as such the assessments identified within this chapter are considered appropriate.

12.15.3 Receptor-led effects

12.15.3.1 It is considered that the greatest potential for receptor led effects across the mWave project would be through the interaction of deviated vessel routes, potential for interaction between leisure users and mWave 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 short duration of the mWave project (18 months) and the designed-in measures which include Notice to Mariners, navigational marking, if needed, and use of guard boats during installation 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 mWave project.

12.16.1.2

Table 12-12: Summary of potential environment effects, mitigation and monitoring at the mWave 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 lead to potential for interaction between leisure users and mWave activities	Promulgation of information including Notice to Mariners and onshore signage, temporary advisory clearance distances, appropriate navigational marking, use of guard boats	Minor	Low	Negligible or Minor (not significant in EIA terms)	None	n/a	None
Operational Phase							
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 Notice to Mariners and onshore signage, appropriate navigational marking, charting, use of guard boats	Minor	Medium	Minor (not significant in EIA terms)	None	n/a	None
Physical presence of devices may reduce under keel clearance	Promulgation of information including Notice to Mariners, navigational marker buoys, use of guard boats	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 Notice to Mariners, appropriate navigational marking	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 Notice to Mariners and onshore signage, temporary advisory clearance distances, appropriate navigational marking, use of guard boats	Minor	Low	Negligible or Minor (not significant in EIA terms)	None	n/a	None
Decommissioning Phase							
of decommissioning activities and associated vessels may lead to potential for interaction between leisure users and mWave activities	Promulgation of information including Notice to Mariners and onshore signage, temporary advisory clearance distances, appropriate navigational marking, use of guard boats,	Minor	Low	Negligible or Minor (not significant in EIA terms)	None	n/a	None

12.17 References

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