TIDAL LAGOON SWANSEA BAY

Environmental Statement
Chapter 14. Navigation and Marine Transport Assessment

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Contents

14.0 Navigation and Marine Transport Assessment

14.1 Introduction

14.1.0.1 This Chapter presents the environmental assessment relevant to shipping and navigation in terms of guidance and legislation; data sources; assessment methodology and significance criteria to be used in the impact assessment; baseline conditions and a high level review of impacts and cumulative impacts during construction; operation/maintenance and decommissioning of the Project. The assessment draws upon and summarises the information contained within the Navigational Risk Assessment (NRA), which is presented at Appendix 14.1, Volume 3.

14.2 Guidance

14.2.1 Primary guidance

14.2.0.1 The primary guidance document which has been used during this assessment is listed below:

i. Maritime and Coastguard Agency (MCA), Marine Guidance Notice 371 (MGN 371 Merchant + Fishing) Offshore Renewable Energy Installations (OREI) *Guidance on UK Navigational Practice, Safety and Emergency Response Issues* (MCA, 2008).

14.2.0.2 MGN 371 provides guidance on the issues that should be taken into consideration when assessing the effect on navigational safety of offshore renewable energy developments proposed within United Kingdom (UK) internal waters, territorial sea or Renewable Energy Zones (REZ). Whilst the Project does not conform fully with the definition of an OREI under the Energy Act 2004, being connected with dry land by a permanent structure providing access at all times for all purposes, MCA guidance on OREIs remains the most appropriate against which to consider the Project, due to the marine nature of the development.

14.2.2 Secondary guidance

14.2.0.1 The following guidance documents have also been used during the assessment:

I. Royal Yachting Association (RYA), *The RYA's Position on Offshore Energy Developments: Paper 3 – Tidal Energy* (RYA, 2012); and

II. Department of Energy and Climate Change (DECC) in association with MCA, *Guidance on the Assessment of Offshore Wind Farms - Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms* (DECC, 2005).

14.3 Assessment methodology

14.3.1 Overview

14.3.0.1 Baseline data, desk based research, consultation undertaken with stakeholders and a hazard workshop enabled the identification of potential impacts associated with the Project during construction, operation/maintenance and decommissioning. This section of the ES describes how this process was undertaken.

14.3.0.2 In addition to the EIA process, in accordance with MCA practices, a Navigational Risk Assessment has been completed and is presented at Appendix 14.1, Volume 3.

14.3.0.3 This ES proceeds on the basis of the outline construction programme as discussed in Chapter 4, Section 4.5.2, which anticipates construction starting in 2015 and with the main construction lasting for about three years. The assessments contained in this chapter are not materially sensitive to works commencing within the anticipated validity of the Development Consent Order (see Chapter 1), which is five years, or to an extension of (say) a further year-or-so.

14.3.2 Data sources

14.3.2.1 The main data sources used in assessing the baseline shipping and navigation activities relative to the Project are listed below:

i. 14 days' marine traffic survey (14th to 28 August 2013) - Automatic Identification System (AIS) data with the addition of radar/Automatic Radar Plotting Aid (ARPA) and supplemented by observations of vessels within visual range from the shore based survey crew;

ii. AIS data gathered over 56 days (28 days in July 2012 and 28 days in October 2012). This time period was used to gather representative winter and summer data for the assessment and is an accepted Maritime and Coastguard Agency (MCA) method as outlined in MGN 371 (MCA, 2008);

iii. Fishing Surveillance Satellite Data (2009) and Sightings Data (2005-2009), from Marine Management Organisation (MMO), shown as density grids;

iv. Maritime Incident Data from the Marine Accident Investigation Branch (MAIB) (2002-2011) and Royal National Lifeboat Institution (RNLI) (2001-2010);

v. Admiralty Sailing Directions – West Coasts of England and Wales Pilot, NP 37, Eighteenth Edition (UKHO, 2011);

vi. UK Admiralty Charts 1161-0 and 1179-0; and

vii. UK Coastal Atlas of Recreational Boating, 2009 and 2010 Geographical Information System (GIS) Shape Files (RYA, 2009).

14.3.2.2 Further information on the data used within the assessment is provided in the following sections.

Navigational features

14.3.2.3 Navigational features have been considered based on information from Admiralty charts and the pilot book for the area (UKHO, 2012).

AIS data and commercial vessel movements

14.3.2.4 AIS is required since 31 May 2012 on board all vessels of more than 300 gross tonnage (GT) engaged on international voyages, cargo vessels of more than 500 GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1st July 2002 and fishing vessels over 24m in length. On 31 May 2013 this was expanded and fishing vessels over 18m must now mandatorily carry AIS.

14.3.2.5 Two periods of AIS data, collected from shore based stations located in proximity to the Project, have been used in the marine traffic analysis, to demonstrate seasonal variation in vessel movements. These periods are as follows:

i. 28 days in July 2012; and

ii. 28 days in October 2012.

14.3.2.6 These data have been cropped to 5 nautical miles ("nm") around the Project to provide a relevant and appropriate study area ("Study Area"). This distance has been used as it is considered to present a sufficient area to capture the relevant issues for the Project in terms of interactions with vessel movements, as well as considering historical marine accident data.

14.3.2.7 The Study Area has been extended to greater than the 5nm buffer where required, to show, for example when presenting dredging areas or navigational features.

14.3.2.8 A 14 day marine traffic survey took place from 14th to 28 August 2013. It acquired AIS, radar and visual observation data which ensured that the movements of smaller vessels, importantly those associated with fishing and recreation activity, were captured. This may not occur with AIS alone, as the carriage requirement excludes vessels under 300gt from mandatory carriage of AIS. Although voluntary carriage of AIS is increasing in popularity, this is most often amongst cruising recreational vessels and fishing vessels navigating farther from the coast, so is still unlikely to capture smaller coastal vessels, hence the AIS data was supported by visual observations. The survey methodology was agreed in advance with the MCA. This additional data supplements the other data sources discussed above, to provide a fuller understanding of the commercial shipping, fishing and recreational vessel movements in the area. The results of the survey have been summarised within the NRA and an overview of key points is presented in Section 14.4.

Fishing activity

14.3.2.9 Fishing vessel data (as per AIS carriage requirements) were extracted from the AIS tracks recorded during 14 days in August 2013; 28 days in July 2012 and 28 days in October 2012. As noted above, there was no requirement for fishing vessels less than 24m in length to carry AIS in 2012, meaning that smaller fishing vessels may not be recorded in the data set.

14.3.2.10 In addition, fishing vessel sightings and satellite vessel monitoring data were obtained from the Marine Management Organisation (MMO) and presented in density grids to validate the survey data presented in the baseline assessment.

14.3.2.11 Sightings data were analysed from the 2005 to 2009 period (full annual analyses). These data have been collected through the deployment of patrol vessels, surveillance aircraft and the sea fisheries inspectorate. Each patrol logs the position and details of fishing vessels within the area being patrolled. All vessels are logged, irrespective of size, provided they can be identified by their Port Letter Number (PLN).

14.3.2.12 Satellites record the positions of fishing vessels in excess of 15m in length at a minimum interval of two hours. Data from 2009 (all nationalities) have been analysed on a full annual basis.

Recreational activity

14.3.2.13 Limited recreational vessel data was extracted from the AIS data recorded during 14 days in August 2013; 28 days in July 2012 and 28 days in October 2012. It is noted that the majority of recreational vessels do not carry AIS, therefore additional data provided by Royal Yachting Association (RYA) and the Cruising Association (CA) has been used to represent the interests of recreational users including yachting and motor cruising.

14.3.2.14 In 2005 the RYA, supported by Trinity House Lighthouse Service (THLS) and the CA, compiled and presented a comprehensive set of charts which defined the cruising routes and general sailing and racing areas used by recreational craft around the UK coast. This information was published as the UK Coastal Atlas of Recreational Boating and has been subsequently updated (RYA, 2009). The latest addition of GIS Shape files from 2010 showing cruising routes, sailing and racing areas has been used in this assessment.

14.3.3 Consultation

14.3.3.1 For the purposes of this navigation assessment, responses to consultation are an important source of data that has been included in the assessment. The following list represents the relevant shipping and navigation stakeholders who took part in the informal consultation with stakeholders and whose responses were contained in the Scoping Opinion in respect of the Project (The Planning Inspectorate, 2012). Details of the responses are provided in Appendix 14.1, Volume 3.

i. Associated British Ports;
ii. City and County of Swansea;
iii. Cruising Association;
iv. Maritime and Coastguard Agency (MCA);
v. Monkstone Sailing and Cruising Club;
vi. Mumbles Motorboat and Fishing Club;
vii. Neath Estuary Group;
viii. Neath Port Authority;
ix. Planning Inspectorate;
x. Royal Yachting Association (RYA);
xi. Swansea Marina;
xii. Swansea Port Health Authority;
xiii. Trinity House Lighthouse Service; and
xiv. Welsh Yachting Association.

14.3.3.2 A number of comments were also received in relation to the Preliminary Environmental Information Report (TLSB, 2013) published in relation to the Project (see Appendix 14.1,

Volume 3). In relation to navigation and marine transport, comments were received from:

I. Associated British Ports;

II. City and County of Swansea; and

III. Welsh Government.

14.3.3.3 The key points and observations from these stakeholders concerning the topic of navigation and marine traffic are addressed within the assessment, with further supporting information presented in the NRA (Appendix 14.1, Volume 3).

14.3.4 Hazard workshop

14.3.4.1 A hazard workshop was held in Swansea on 30th April 2013 attended by maritime stakeholders in order to gain local knowledge of the area and to identify the key navigational safety concerns relative to the Project. Attendees included:

i. ABP;

ii. Chamber of Shipping;

iii. County and City of Swansea;

iv. Cruising Association;

v. Local Fisherman;

vi. MCA;

vii. Neath Port Authority;

viii. RYA;

ix. South West Wales Fisheries Committee;

x. Swansea Dry Docks;

xi. Swansea Marina ;

xii. Swansea Port Health Authority;

xiii. Tawe Boat club; and

xiv. Thomas Shellfish Limited.

14.3.4.2 During the workshop, a presentation was given of the available baseline data and working groups were set up to identify potential hazards associated with the Project. The potential hazards, presented in Section 14.5, were used as the basis for identifying and assessing the potential impacts associated with the construction, operation and decommissioning (Section 14.6) phases of the Project.

14.3.5 Significance criteria

14.3.5.1 Impacts on shipping and navigation receptors, that were formulated based on hazards identified at the workshop, were assessed during the EIA using a consistent scale of sensitivity and magnitude, as described in the following sections.

Sensitivity

14.3.5.2 A shipping and navigation receptor can only be sensitive if there is a pathway through which an impact can be transmitted between the source activity and the receptor. When a receptor is exposed to an impact, the overall sensitivity of the receptor is determined and that process incorporates a degree of subjectivity. Sensitivity assessments for shipping and navigation receptors used the following sources, and applied expert opinion (Anatec Ltd who have prepared this assessment), to define the sensitivity of a receptor:

i. Outputs of the hazard workshop (see Section 14.5);

ii. Level of stakeholder concern;

iii. Number of transits of specific vessel and/or vessel type; and

iv. Lessons learnt from existing renewable energy developments.

14.3.5.3 For the purposes of assessing the impact to marine receptors a sensitivity must be judged. The criteria is ranged from neutral (sensitivity) to very high. The greater the safety impact and/or the lower the ability to adapt to the impact, the greater the sensitivity. A safety impact is classified as any impact that may influence the navigational safety of the marine receptor. Once a sensitivity is defined the assessment is made to the magnitude, which is defined by geographical extent, frequency of occurrence and duration. These are then used in the significance matrix to define the impact significance.

14.3.5.4 Table 14.1 presents the definitions of sensitivity used in this assessment.

Table 14.1 Sensitivity criteria for shipping and navigation

Sensitivity	Definition
Very High	• Very high level of safety impact for shipping and navigation receptors • Very limited ability to adapt to impact
High	• High level of safety impact for shipping and navigation receptors • Limited ability to adapt to impact
Medium	• Medium level of safety impact for shipping and navigation receptors • Some ability to adapt to impact
Low	• Low level of safety impact for shipping and navigation receptors • Ability to adapt to majority of impact
Negligible	• Negligible level of safety impact for shipping and navigation receptors • Ability to adapt to all of impact
Neutral	• No impact for shipping and navigation receptors

Magnitude

14.3.5.5 When assessing the magnitude of an impact, the geographical extent, the duration and the frequency of occurrence are considered.

14.3.5.6 Determining the overall magnitude of shipping and navigation impacts also incorporates a degree of subjectivity, as decisions are based on expert opinion, as identified above, in combination with baseline data and the following inputs:

i. Consultation feedback from stakeholders;

ii. Outputs of the Hazard Workshop in particular where 'unacceptable' ranked impacts were identified; and

iii. Lessons learnt or research from previous renewable energy developments.

14.3.5.7 Table 14.2 presents the definitions of magnitude used in this assessment. The potential "effects" of the Project are identified on a project basis through the hazard workshop and stakeholder feedback as discussed in Sections 14.3.3 and 14.3.4.

Table 14.2 Magnitude criteria for shipping and navigation

Magnitude	Definition
Major Negative	• Impact geographical area beyond the extent of Swansea Bay • Impact present on a permanent basis throughout the operation of the Lagoon • Impact occurs very frequently to constantly/permanently
Moderate Negative	• Impact localised to geographical extent of Swansea Bay • Impact present on a permanent basis throughout the operation of the Lagoon • Impact occurs frequently
Minor Negative	• Impact localised to geographical extent of Lagoon boundary • Impact present on a temporary basis • Impact relatively infrequent
Neutral	• No impact on shipping and navigation receptors
Positive	• Shipping and navigation receptors benefit as a result of the impact

Impact significance

14.3.5.8 Based on the sensitivity of the receptor and the magnitude of the potential impact, the significance of the impact is determined according to the risk matrix presented in Table 14.3.

Table 14.3 Impact Significance

		Magnitude				
		Major Negative	**Moderate Negative**	**Minor Negative**	**Neutral**	**Positive**
Sensitivity	**Very High**	Major Adverse	Major Adverse	Moderate to Minor Adverse	No Impact	Major to minor beneficial
	High	Major Adverse	Major to Moderate Adverse	Minor Adverse	No Impact	Major to minor beneficial
	Medium	Moderate Adverse	Moderate to Minor Adverse	Minor Adverse	No Impact	Moderate beneficial
	Low	Minor Adverse	Minor Adverse	Insignificant	No Impact	Minor beneficial
	Negligible	Minor/ Insignificant	Insignificant	Insignificant	No Impact	Insignificant
	Neutral	No impact	No impact	No impact	No impact	No impact

14.3.5.9 This assessment of significance will assume that the following embedded mitigation measures are in place:

i. Compliance with MGN 371 (MCA, 2008);

ii. Recommendations outlined IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) O-139 for lighting and marking (IALA, 2008) and consultation with THLS on final lighting and marking for the development; and

iii. Vessel compliance with COLREGS (International Regulations for Preventing Collisions at Sea).

14.3.5.10 Where possible, appropriate mitigation measures have been incorporated into the design of the Project as embedded mitigation.

14.3.5.11 Following the assessment of significance of each impact (assuming embedded mitigation measures are in place), additional mitigation measures to further reduce the risk are identified. Finally, the residual risk is stated.

14.4 Baseline conditions

14.4.1 Overview

14.4.1.1 This section provides an overview of the baseline conditions in terms of navigational features, emergency response, maritime incidents, RNLI incidents, marine traffic analysis and marine traffic survey. Further details are provided in Appendix 14.1, Volume 3.

14.4.2 Navigational features

14.4.2.1 Figure 14.1 presents an overview of the principal navigational features in proximity to the Project.

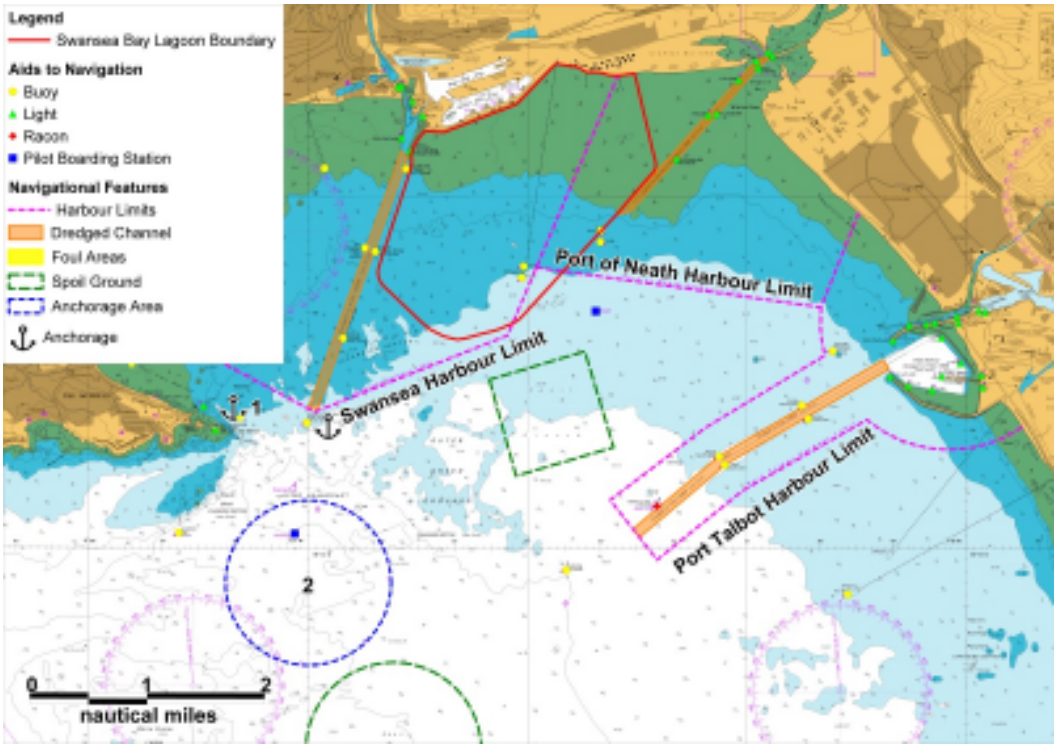

Figure 14.1 Principal navigational features in proximity to the Project

14.4.2.2 The Project intersects the Swansea Harbour and Port of Neath Harbour Limits. Swansea, Port of Neath and Port Talbot Harbours all have a dredged channel in their approaches, with only the Neath channel having training walls (built in the Victorian era) along the channel's alignment. A description of these channels from the pilot book (UKHO, 2011) is as follows:

i. Port of Swansea: Depth is 4.2m in the entrance channel;

ii. Port of Neath: The entrance channel is 76m wide and dredged to 2.0m above chart datum; and

iii. Port Talbot: The entrance channel to the tidal harbour is dredged to 11.2m, and that to Old Dock is dredged to 0.4m.

14.4.2.3 The Lagoon boundary is approximately 0.4nm and 2.8nm north of charted spoil grounds. The inner spoil ground, closer to the Swansea Harbour Limit and the area of the Project has been closed for some years, with the more southerly Swansea Bay (Outer) deposit ground (LU130) being used to dispose of material from maintenance dredging of the channels. It is proposed that the more southerly disposal ground will be used to dispose of surplus dredged material associated with the Project.

14.4.3 Metocean data

14.4.3.1 The climate in the general region is a mild, maritime climate, which can become unsettled at times with strong winds and rough seas, especially in winter months. Visibility is generally good, with fog at sea most common in June, but relatively infrequent from November through to May. The predominant wind direction is from the south west (UKHO, 2011).

14.4.3.2 Chart tidal diamonds indicate that currents in the area are set in a south westerly direction on the ebb and an easterly direction on the flood, with a peak spring tidal rate of 1.6 knots and peak neap rate of 0.8 knots.

14.4.4 Emergency response

MCA including HM Coastguard (HMCG)

14.4.4.1 HM Coastguard co-ordinates Search and Rescue (SAR) through a network of 16 Maritime Rescue Co-ordination Centres (MRCCs). The nearest rescue coordination centres to the Project are the Swansea and Milford Haven MRCCs. However, Swansea MRCC is set to close in 2014/15 and Milford Haven will become a Maritime Rescue Sub-Centre.

Emergency Response – Search and Rescue (SAR) Helicopters

14.4.4.2 A review of the assets in proximity to the Project indicates that the closest SAR helicopter base, at present, is located at Chivenor, approximately 31nm to the south of the Lagoon boundary. Due to the privatisation of the UK's SAR operations, the base at Chivenor will close (anticipated between 2015 and 2017), with the new, closest, base being located in St Athan in Wales, approximately 21nm from the Lagoon boundary. The location of these two bases, relative to the Lagoon is presented in Figure 14.2.

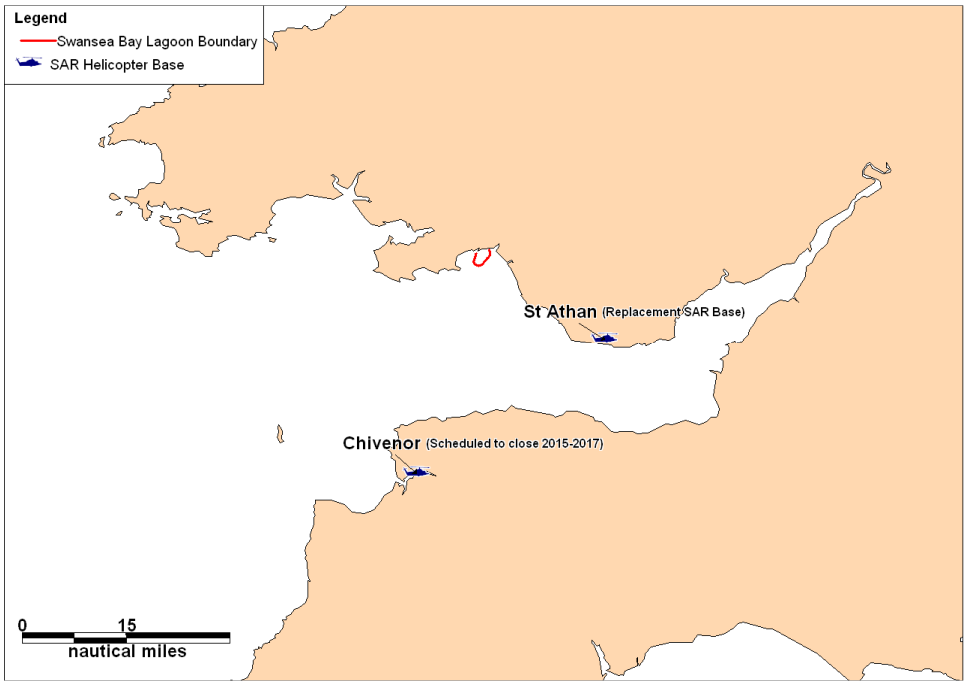

Figure 14.2 SAR helicopter bases relative to Project

Emergency response – RNLI Lifeboats

14.4.4.3 The RNLI maintains an active fleet of over 300 lifeboats (of various types ranging from 5m to 17m in length) and a relief fleet of around 100 boats at 235 stations round the coast of the UK and Ireland. The RNLI stations in the vicinity of the Project are presented in Figure 14.3.

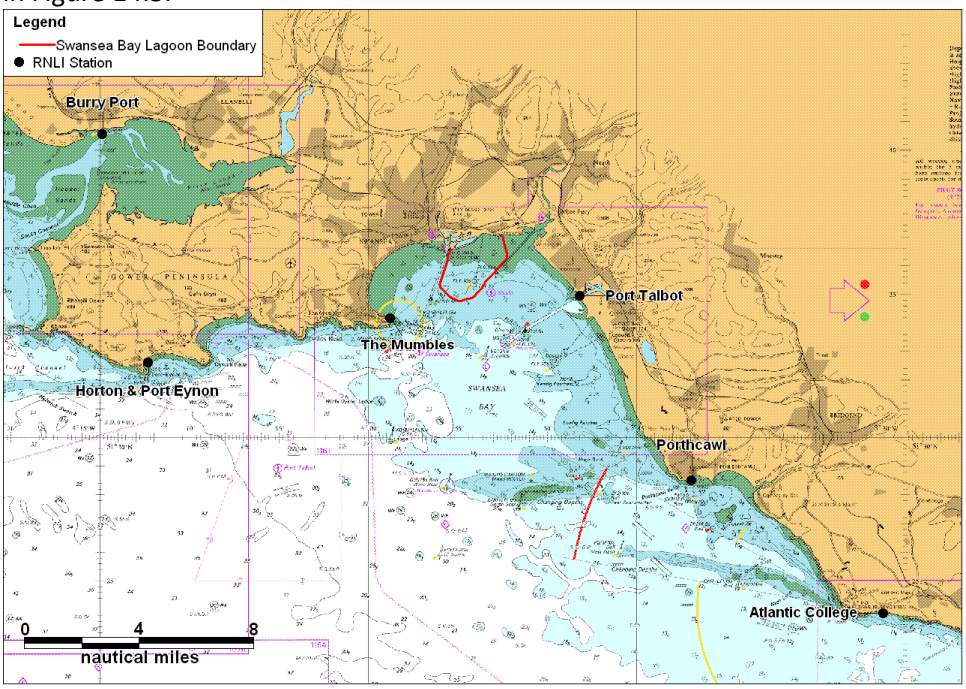

Figure 14.3 RNLI bases in proximity to Project

14.4.4.4 At each of these stations, crew and Inshore Lifeboats (ILB) and/or All-Weather Lifeboats (ALB) are available on a 24-hour basis throughout the year. Table 14.4 provides a summary of the facilities at the stations closest to the Project.

Table 14.4 Lifeboats held at nearby RNLI stations

Station	Lifeboats	ALB Spec	ILB Spec	Distance to Lagoon Boundary
The Mumbles	ALB & ILB	Tyne	D Class	2.06 nm
Port Talbot	ILB	-	D Class	2.87 nm

14.4.4.5 A new RNLI station at the Mumbles is being built as part of the pier regeneration project. Work on the lifeboat station is expected to be completed in early 2014 and this station is to accommodate the RNLI's new Tamar class lifeboat, which arrived in Swansea in October 2013. The Tamar class lifeboat, which is larger and faster than the previous Tyne class lifeboat, was successfully launched and retrieved from the new slipway in early December 2013 as part of a period of testing.

14.4.5 Maritime incidents

MAIB incidents

14.4.5.1 This section reviews maritime incidents that have occurred in the vicinity of the Project in recent years.

14.4.5.2 All UK commercial vessels are required to report accidents to MAIB. Non-UK vessels do not have to report unless they are in a UK port or are in 12 mile territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report accidents to MAIB.

14.4.5.3 The locations of accidents, injuries and hazardous incidents reported to MAIB within 5nm of the Project for a ten year period (January 2002 to December 2011) are presented in Figure 14.4, colour-coded by type.

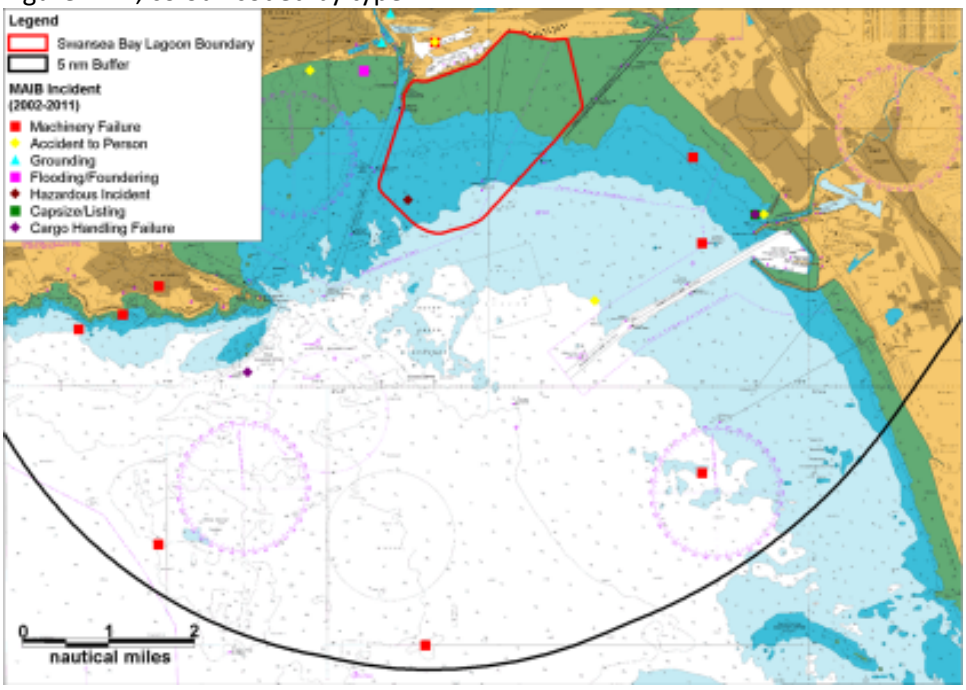

Figure 14.4 10 year MAIB incident locations by type (within 5nm of the Project)

14.4.5.4 A total of 24 unique incidents involving 25 vessels were reported within 5nm of the Project, corresponding to 2 to 3 incidents per year.

14.4.5.5 The most common incident types recorded by MAIB within 5nm of the Project between 2002 and 2011 were machinery failure (36%), accident to person (20%) and grounding (12%).

RNLI incidents

14.4.5.6 Data on RNLI lifeboat responses within 5nm of the Project in the ten-year period between 2001 and 2010 have been analysed and are presented in Figure 14.5, colour-coded by casualty type.

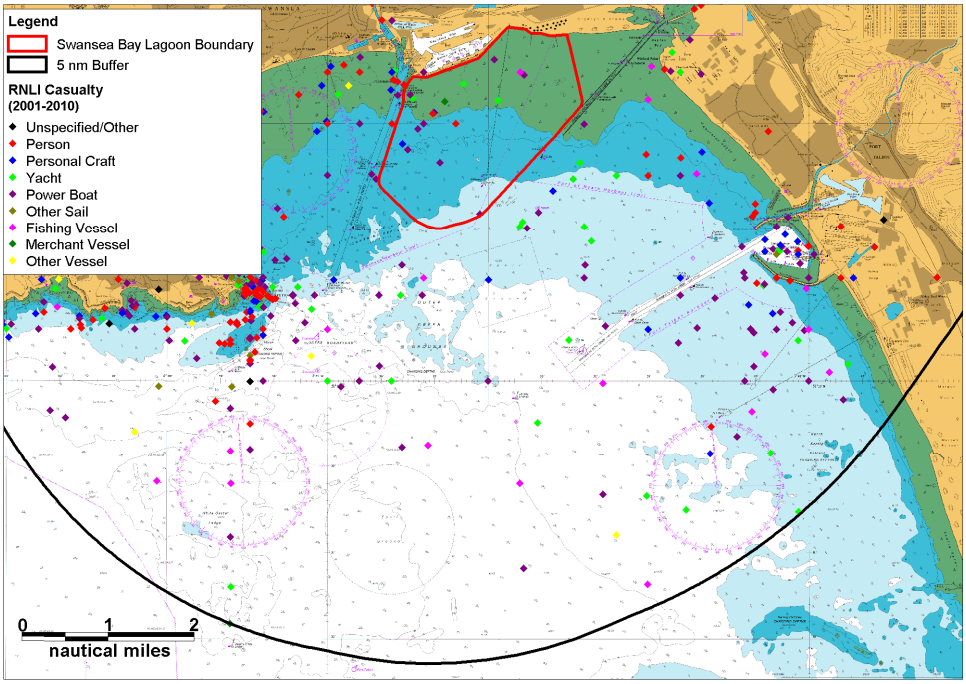

Figure 14.5 10 Year RNLI incidents by casualty type (within 5nm of the Project)

14.4.5.7 A total of 54 incidents were recorded within the Study Area in the 10 year period analysed, giving an average of 5 to 6 incidents per year. The co-ordinates provided often recorded multiple incidents in the same location, so the above figure does not show every incident individually.

14.4.5.8 The majority of these casualties within the Project boundary were persons (33%) and power boats (33%) with yachts and personal craft accounting for 19% and 9% respectively.

14.4.5.9 The vast majority of incidents within the 5nm buffer were responded to by the ILBs from either Mumbles (65%) or Port Talbot (20%) or the ALB from Mumbles (13%).

14.4.6 Marine traffic analysis

Commercial shipping

14.4.6.1 Plots of the AIS vessel tracks recorded during 28 days in July 2012 and 28 days in October 2012, within 5nm of the Project, are presented in Figure 14.6 and Figure 14.7, colour coded by vessel type. Tracks of any temporary vessels operating in the area have been removed and excluded from further analysis.

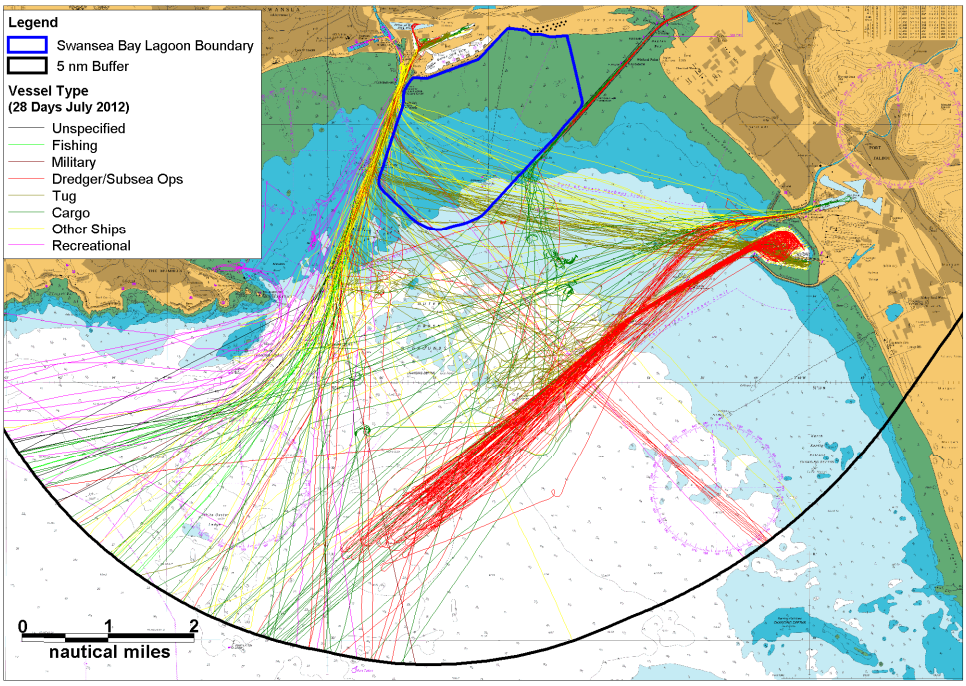

Figure 14.6 AIS data within 5nm buffer (28 Days July 2012)

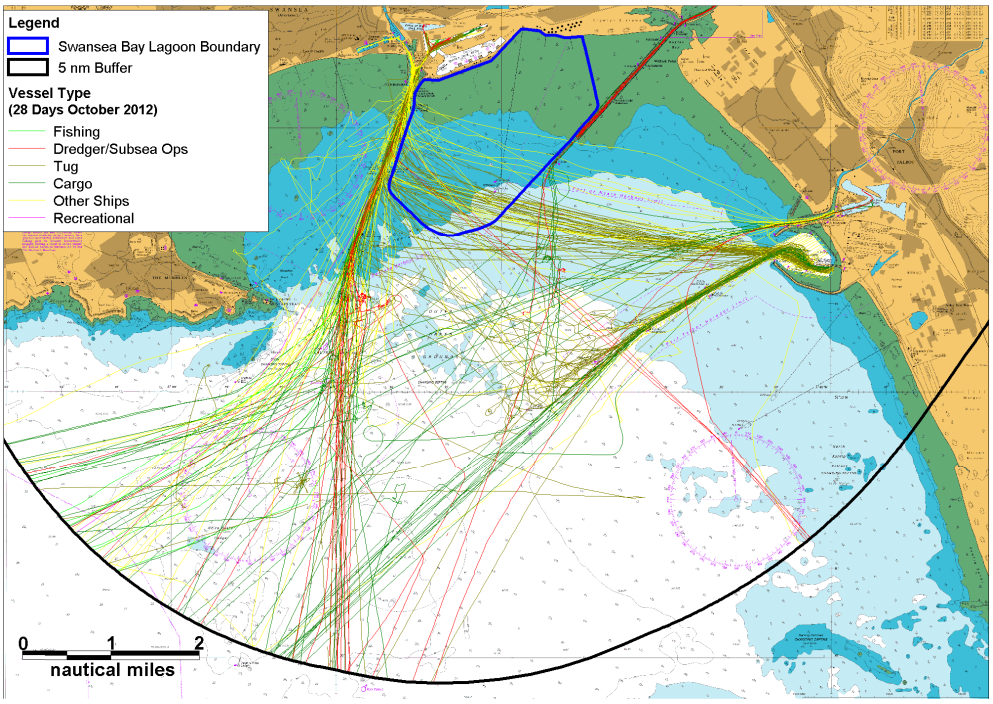

Figure 14.7 AIS data within 5nm buffer (28 Days October 2012)

14.4.6.2 Analysis of vessel types in the area has shown that the main vessel types transiting within 5nm of the Project are cargo vessels, dredgers and tugs.

14.4.6.3 During the 28 days in July 2012, an average of 6 unique vessels per day were recorded on AIS passing within 5nm of the Project. In terms of vessels actually intersecting the area of the Project, there were an average of 2 unique vessels per day, the majority of which were tugs and pilot vessels associated with the ports.

14.4.6.4 During the 28 days in October 2012, an average of 6 unique vessels were recorded on AIS per day passing within 5nm of the Project. In terms of vessels actually intersecting the Lagoon boundary, there were an average of 2 unique vessels per day, the majority of which were tugs and pilot vessels associated with the ports.

14.4.6.5 Of the 56 days analysed, the busiest days were 3 July, 24 July and 9 October 2012, when 12 unique vessels were recorded within 5nm of the Project. Vessel tracks recorded on one of the busiest days are presented in Figure 14.8.

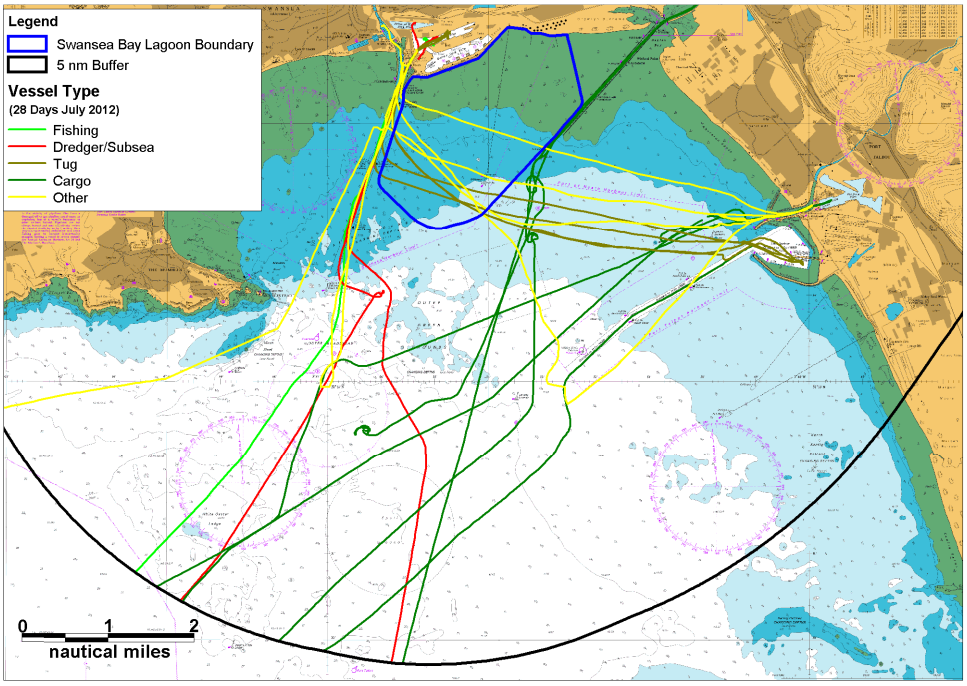

Figure 14.8 AIS vessel tracks busiest day (3 July 2012)

14.4.0.1 Anchored vessels can be identified based on the AIS navigational status which is set on the AIS transmitter on board a vessel. Information is manually entered into the AIS. Therefore, it is common for vessels not to update the navigational status if they are anchored for only a short period of time. For this reason, for the purpose of this study, those vessels which travelled at a speed of less than 1 knot for more than 30 minutes, were assumed to be at anchor for a period of time. No vessels were recorded at anchor within the Lagoon boundary during the periods analysed. Figure 14.9 presents a plot of anchored vessels within the 5 nm buffer during 56 days in July and October 2012.

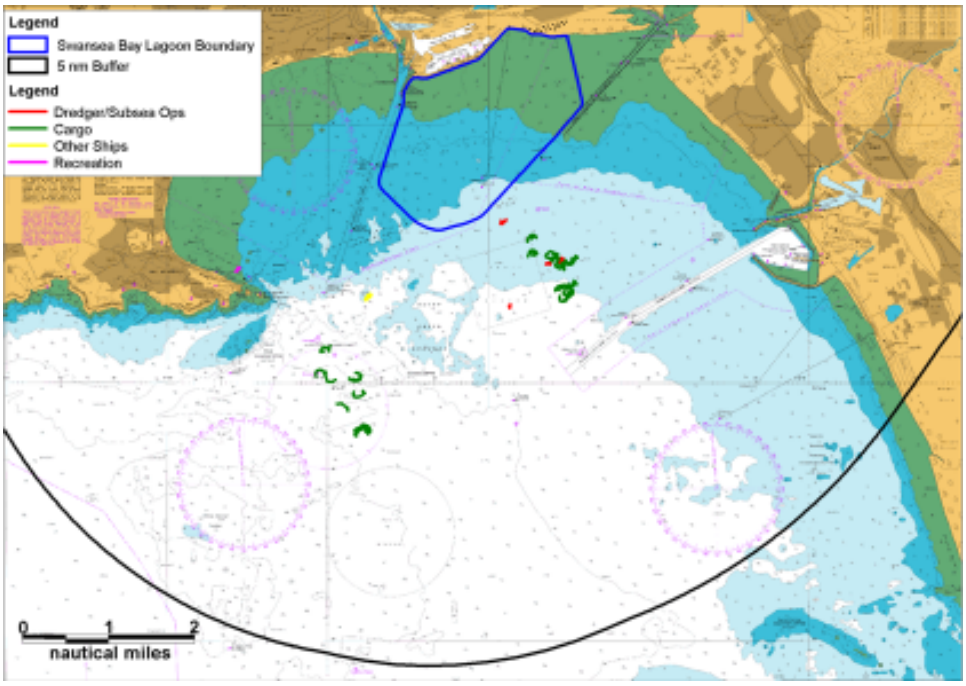

Figure 14.9 Anchored vessels (56 days July and October 2012)

14.4.6.6 The majority of vessels recorded at anchor were cargo vessels and dredgers. The closest vessel anchoring to the Project was the suction dredger *Arco Dart* which was recorded at anchor for approximately 6 hours on 25 July 2012, 0.2nm from the Project.

Fishing vessels

14.4.6.7 This section reviews the commercial fishing vessel activity in the vicinity of the Project based on AIS data and sightings/satellite data.

14.4.6.8 Fishing vessel activity was recorded on AIS in July 2012 and October 2012, as presented in Figure 14.10 and Figure 14.11 respectively. At this time all fishing vessels above 24m were obligated to carry AIS, although it is voluntarily adopted below this vessel length threshold.

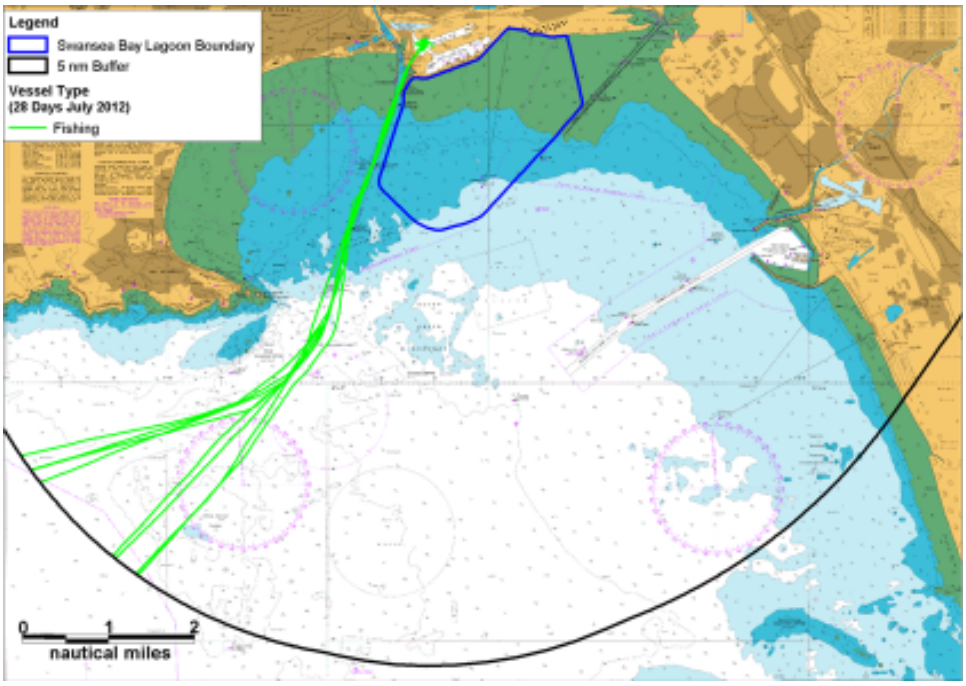

Figure 14.10 Fishing vessels AIS tracks (28 days July 2012)

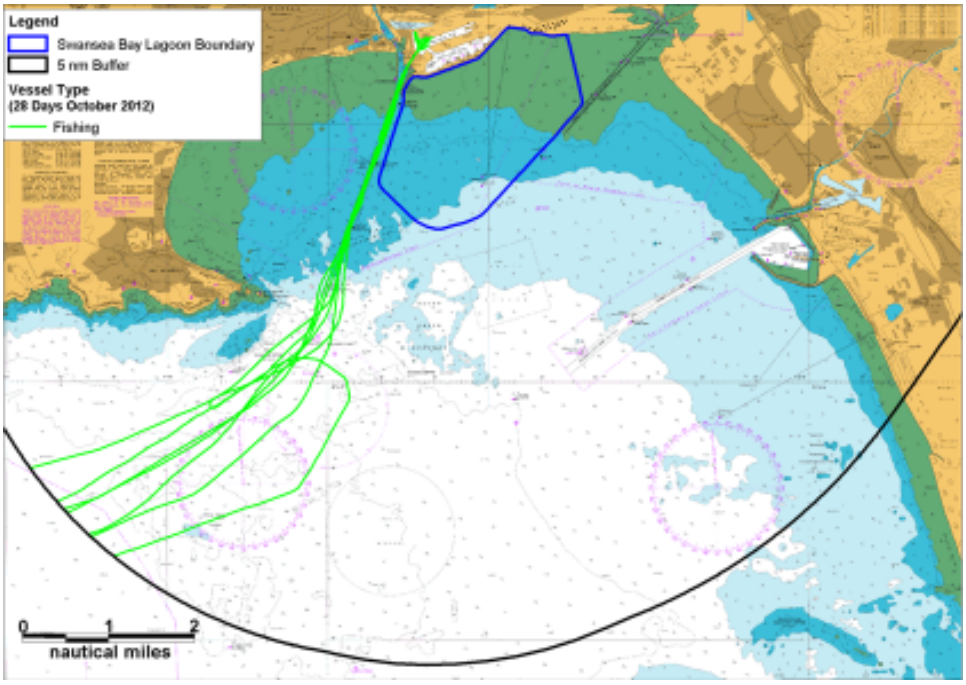

Figure 14.11 Fishing vessels AIS tracks (28 days October 2012)

14.4.6.9 It can be seen that fishing vessels were recorded to the west of the Lagoon boundary, using the dredged channel in and out of Swansea marina. Three unique vessels were recorded during the 28 days in July 2012 with three unique vessels also being recorded during the 28 days in October 2012.

14.4.6.10 The AIS tracks of these fishing vessels indicate that the vessels transit the channel to/from the Port of Swansea to fishing grounds outside of Swansea Bay, to the west/south west.

14.4.6.11 Fishing vessel sightings data (2005-2009) and fishing vessel satellite data (2009) have been converted to density plots and are presented in Figure 14.12 and Figure 14.13 respectively.

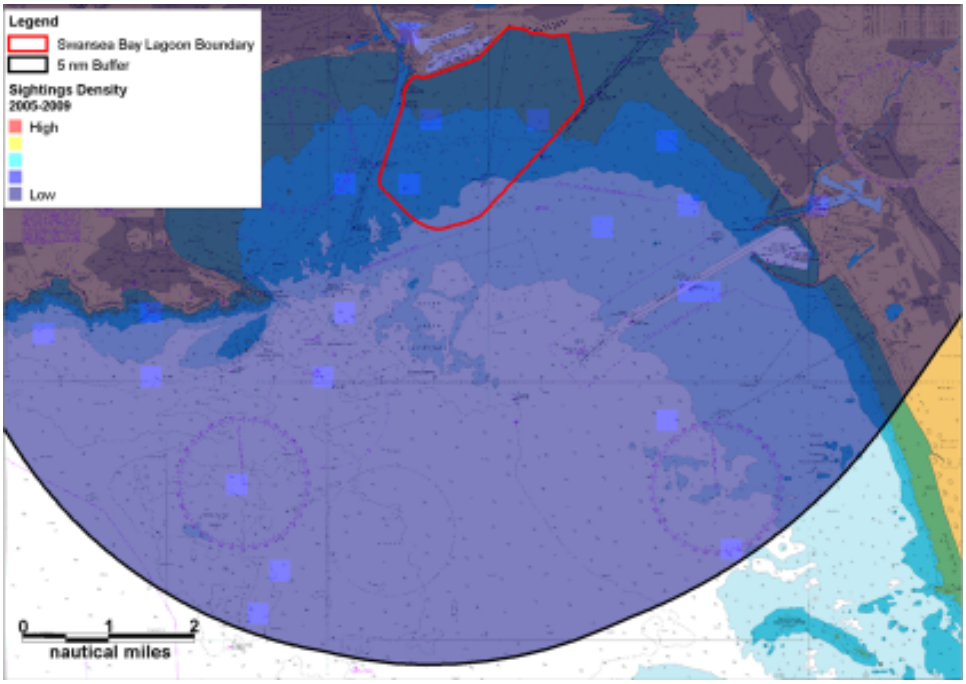

Figure 14.12 Fishing vessel sightings data (2005-2009)

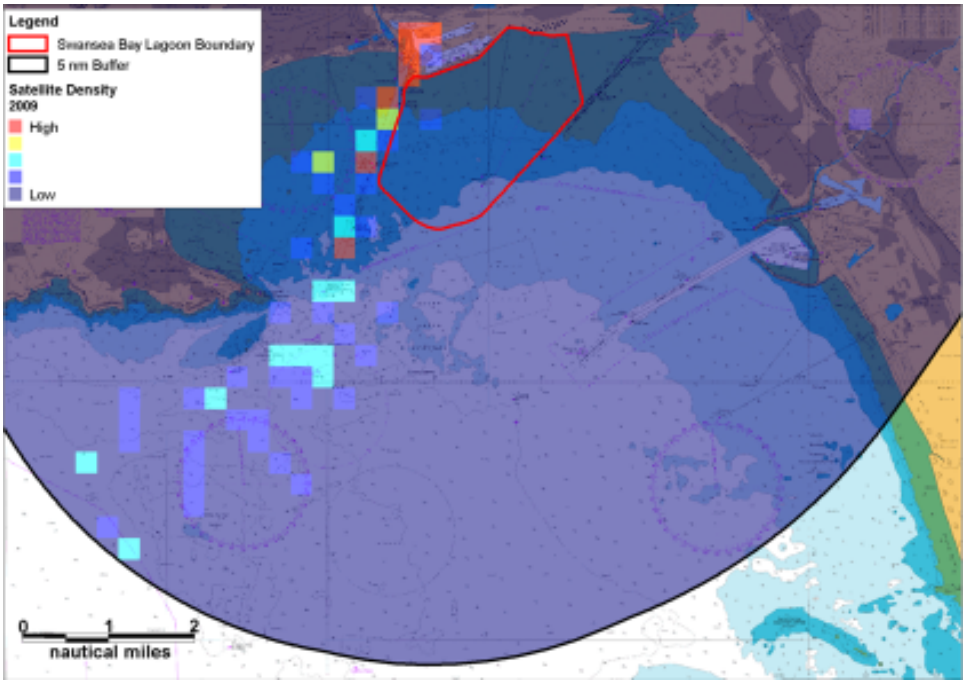

Figure 14.13 Fishing vessel satellite data (2009)

14.4.6.12 From analysis of the fishing vessel sightings data, it can be seen that the level of fishing is very low (low: 0-1 vessel) with no areas having a medium or high density (i.e. greater than 1 vessel). The main gear types recorded in the vicinity of the Project in the vessel sightings data set were trawlers (38%), potters/whelkers (19%) and stern trawlers (19%). Beam trawlers and gill netters were also recorded. All vessels recorded were registered in the UK or Ireland.

14.4.6.13 From analysis of the satellite data, it has been identified that fishing vessels recorded in the satellite data were registered in Belgium, the United Kingdom, Ireland and the Netherlands. The majority of fishing vessels in the satellite data set did not specify their type, but those which did, were recorded as beam trawlers.

Recreational vessels

14.4.6.14 This section reviews recreational vessel activity in the vicinity of the Project based on information published by the RYA, as well as AIS tracking of recreational vessels which carry AIS.

14.4.6.15 Recreational vessel activity was recorded on AIS in July 2012 and October 2012, as presented in Figure 14.14 and Figure 14.15 respectively.

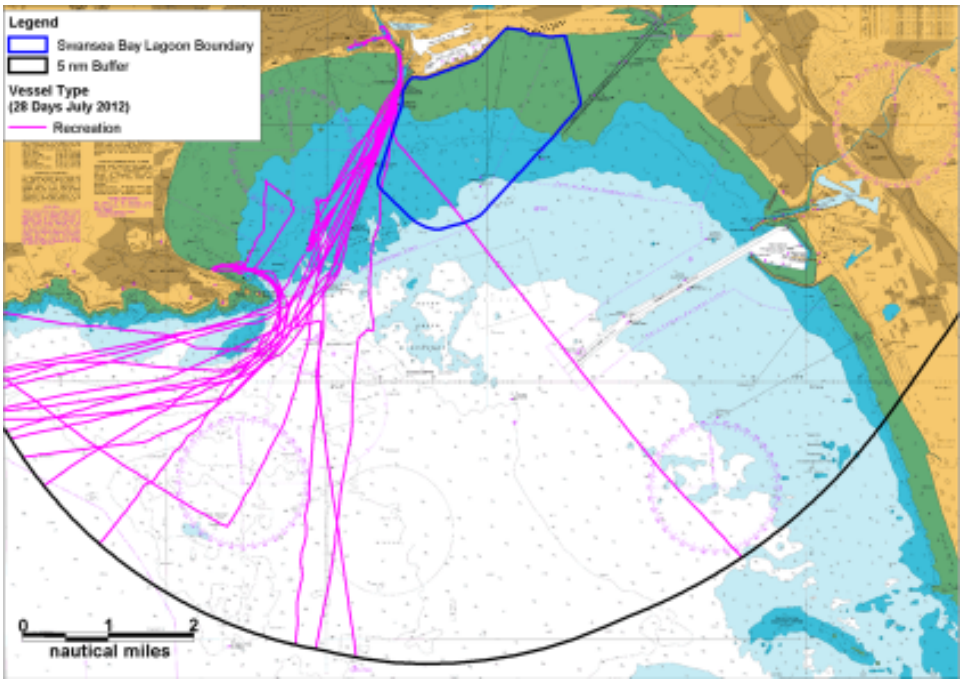

Figure 14.14 Recreational vessels (28 days July 2012)

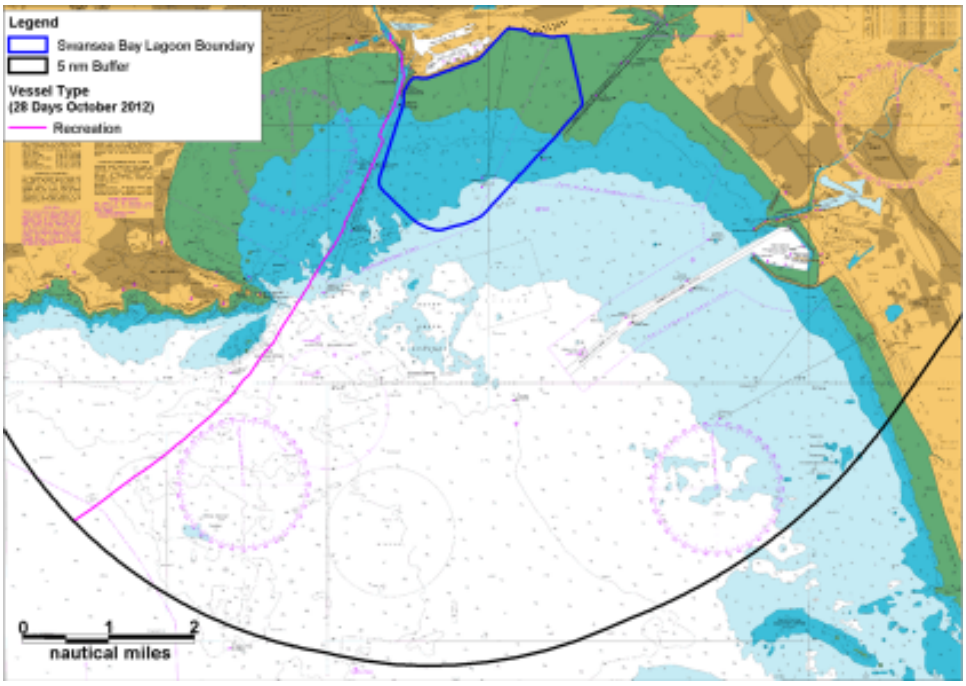

Figure 14.15 Recreational vessels (28 days October 2012)

14.4.6.16 It can be seen that recreational vessels were recorded transiting in and out of Swansea port, to the west of the Lagoon boundary, with a greater number of vessels recorded in summer compared to winter.

14.4.6.17 A plot of the recreational cruising routes and facilities in Swansea Bay is presented in Figure 14.16.

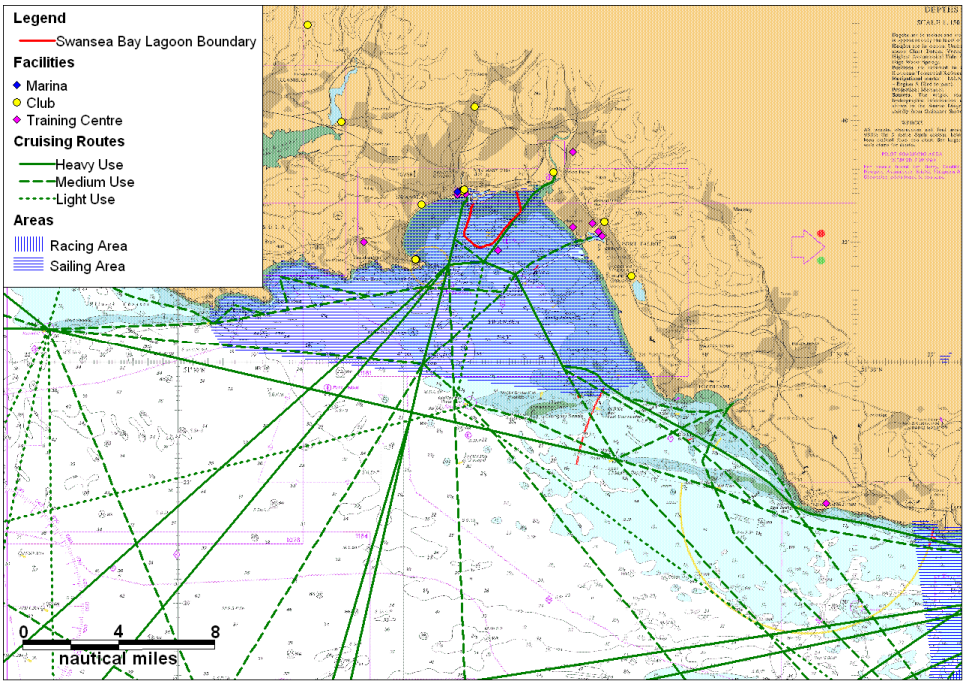

Figure 14.16 RYA Overview of recreational cruising routes and facilities

14.4.6.18 There is one heavy use cruising route[1] to the eastern side of the Project. There is also a heavy use route headed into Swansea to the west of the Project, and a medium use route to the south. The Project is located within a general sailing area and there are a number of recreational facilities located within Swansea Bay as a whole. The pink diamond to the south east of the boundary indicates a general location where training courses take place, but there is no fixed infrastructure at this location.

14.4.7 Marine traffic survey

Marine traffic

14.4.7.1 Plots of the AIS vessel tracks, radar tracked vessels and visually located targets recorded during the 14 day survey period in August 2013, within 5nm of the Lagoon are presented in Figure 14.17. These tracks are colour coded by vessel type.

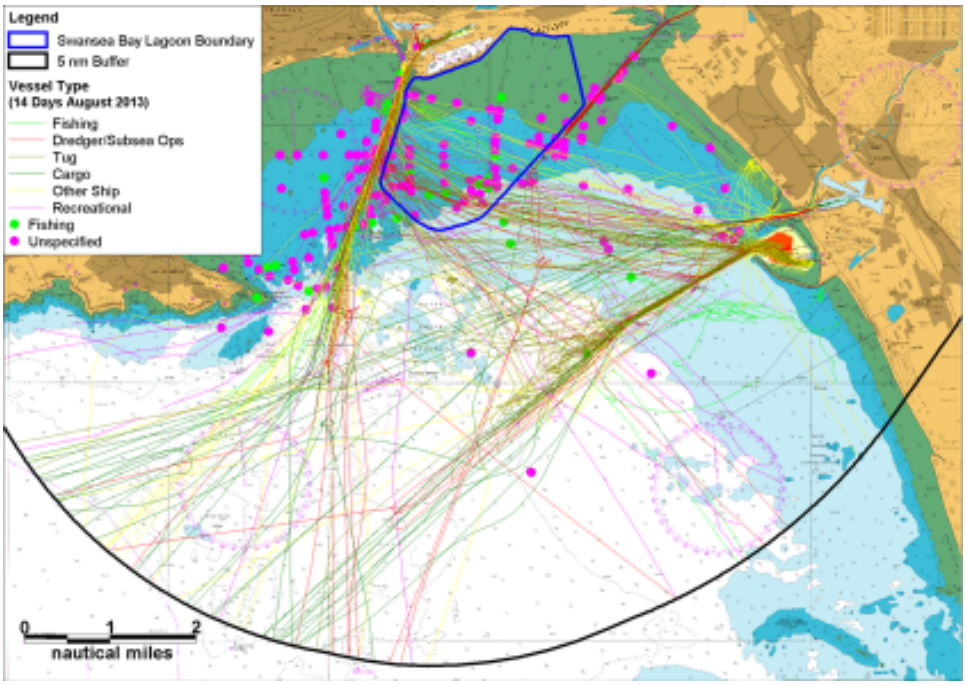

Figure 14.17 AIS Data within 5nm buffer (14 days August 2013)

14.4.7.2 The most common vessel type recorded within 5nm of the Project area during the survey were recreational vessels operating out of the Port of Neath and Port of Swansea.

14.4.7.3 There was an average of 34 (11 by AIS/radar and 23 visual) unique vessels per day passing within 5nm of the Project. In terms of vessels actually intersecting the Lagoon boundary, there was an average of 14 vessels per day.

[1] RYA cruising route classification: Recreational boating, both under sail and power is highly seasonal and highly diurnal. The division of recreational craft routes into Heavy, Medium and Light Use is somewhat arbitrary although there is widespread agreement on the assignments to these classes indicated on the charts. **Heavy Recreational Routes**: - Very popular routes on which a minimum of 6 or more recreational vessels will probably be seen at all times during summer daylight hours. These also include the entrances to harbours, anchorages and places of refuge. **Medium Recreational Routes**: - Popular routes on which some recreational craft will be seen at most times during summer daylight hours. **Light Recreational Routes**: - Routes known to be in common use but which do not qualify for medium or heavy classification (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197285/SEA6_Boating_RYA.pdf)

14.4.7.4 Of the 14 days analysed, the busiest day was 25 August 2013, when 60 unique vessels were recorded within 5nm of the Project. Vessels tracked on the busiest day are presented in Figure 14.18.

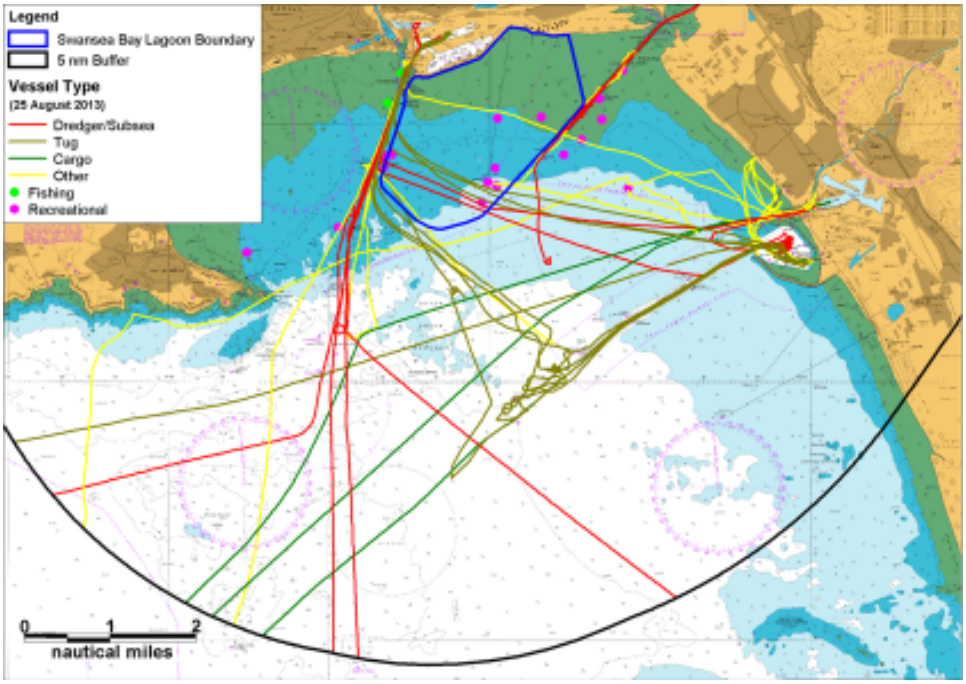

Figure 14.18 AIS data on busiest day (25th August 2013)

14.4.7.5 No vessels were recorded at anchor within the lagoon boundary during the periods analysed. The closest vessel anchoring to the lagoon boundary was a fishing vessel at anchor just at the lagoon boundary. Figure 14.19 presents a plot of anchored vessels within the 5nm buffer during 14 days in August 2013.

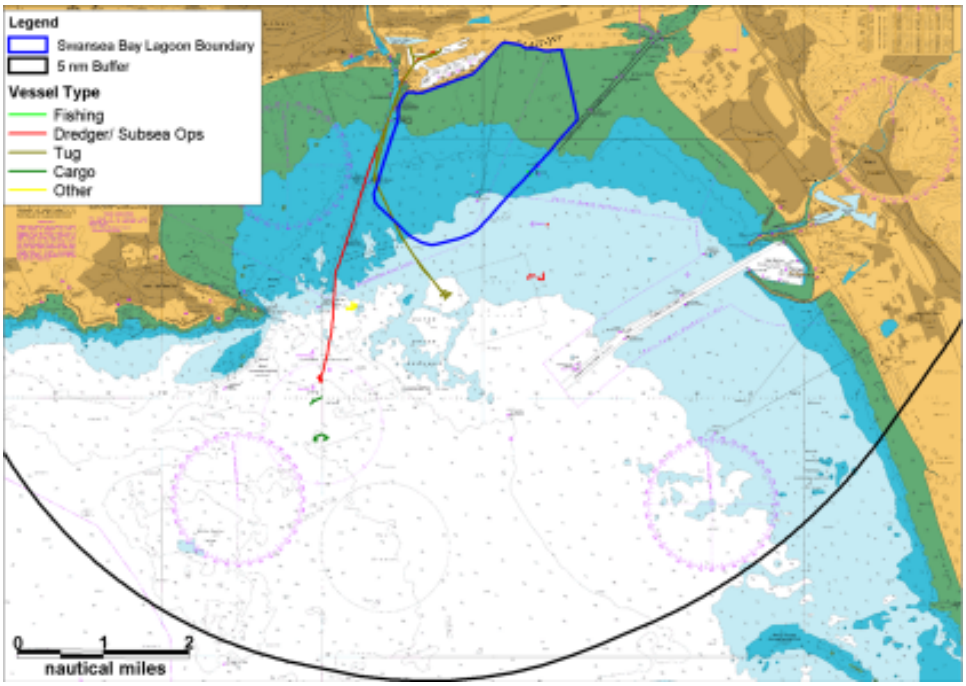

Figure 14.19 Anchored vessels (14 days August 2013)

Fishing vessels

14.4.7.6 This section reviews the fishing vessel activity in the vicinity of the Project based on AIS, radar and visual observation data. Fishing vessel activity recorded in August 2013 is presented in Figure 14.20.

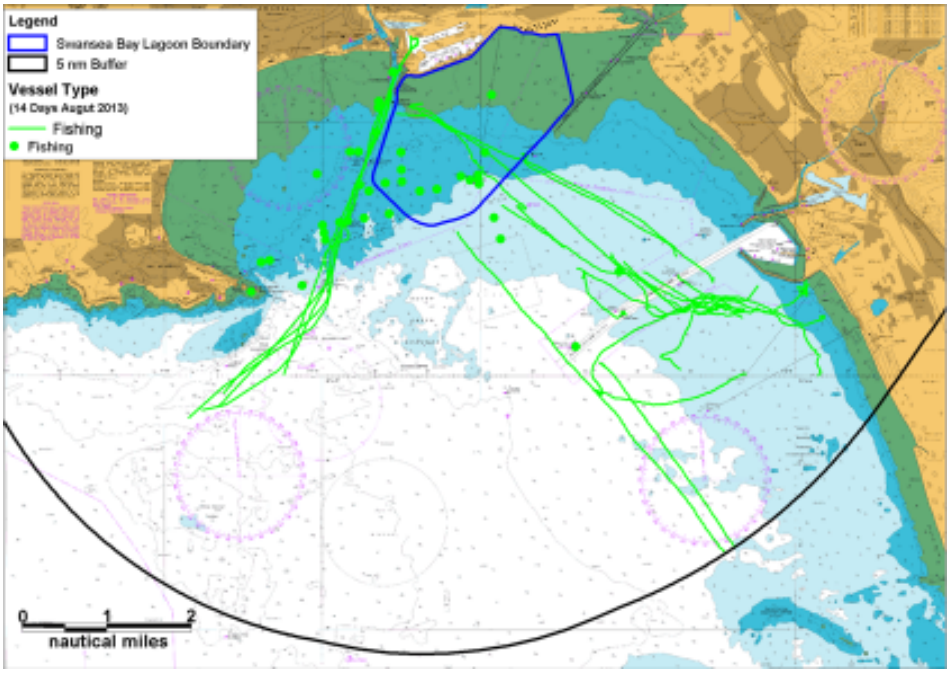

Figure 14.20 Fishing vessels (14 days August 2013)

Recreational vessels

14.4.7.7 This section reviews recreational vessel activity in the vicinity of the Project based on information from information from AIS, radar and visual tracking of recreational vessels. Recreational vessel activity was recorded in August 2013, as presented in Figure 14.21.

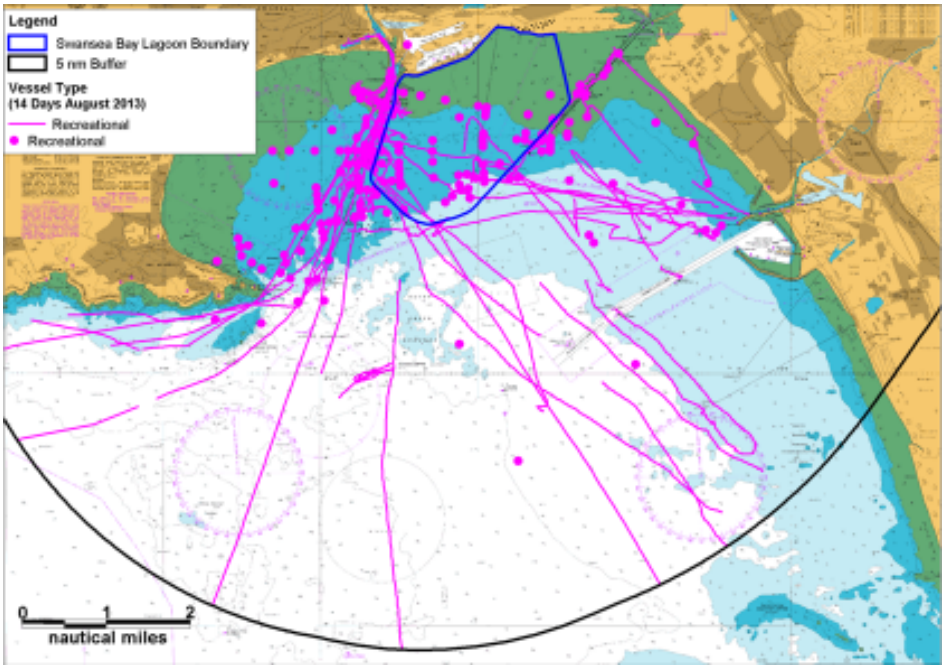

Figure 14.21 Recreational vessels (14 days August 2013)

14.4.7.8 It can be seen that the recreational vessels recorded in August 2013 are comparative to those recorded during in July 2012 (Figure 14.14), with many transiting in and out of Swansea port to the west of the Lagoon boundary.

14.5 Hazard workshop impact assessment

14.5.0.1 As noted above, a Hazard Workshop was undertaken in respect of the Project with key stakeholders. This was used in order to identify/verify risks associated with the Project for the purposes of assessment.

14.5.0.2 During the hazard workshop held on 30 April 2013, a presentation was given of the baseline data available for the Project. Working groups were then set up to identify potential hazards that might be associated with the Project. A total of 20 hazards were identified during the workshop. The hazards were:

i. Change to current Search and Rescue responses;
ii. Person falling from vessel drifts into turbines;
iii. Drifting vessel allision with turbine housing or lagoon wall;
iv. Vessel allision with lagoon wall at high water during severe adverse weather;
v. Grounding due to reduced water depth in navigational channels and rivers;
vi. Lagoon lights not visible against shore based lights;
vii. Effects of light pollution during construction and operation;
viii. Increased vessel to vessel collision risk;
ix. Vessel to vessel collision risk with work vessels on site;
x. Wave reflection affecting vessel navigation in normal weather conditions;
xi. Wave reflection affecting vessel navigation during adverse weather conditions;
xii. Impacts on vessels current emergency plans;
xiii. Vessel towed in with no rudder or not under own power;
xiv. Impact on commercial ferries bound to/from Swansea Port;
xv. Impacts on use of existing pilot boarding stations;
xvi. Vessel displacement;
xvii. Vessel allision with lagoon wall in adverse weather;
xviii. Vessel stuck on lagoon wall;
xix. Siltation within lagoon reducing water depth; and
xx. Loss of transit routes.

14.5.0.3 These potential risks were used to create a hazard log, which was then circulated to attendees and invitees for review. The hazard log which has been used to inform the ES and in particular the impacts assessed in this chapter, can be found in Appendix 14.2, Volume 3.

14.5.0.4 From the 20 hazards identified above, 6 were identified as being capable of posing unacceptable levels of risk in the worst case scenario, except where specific mitigation measures were imposed as part of the Project. These were:

I. Change to current Search and Rescue responses;
II. Drifting vessel allision with turbine housing or lagoon wall;
III. Increased vessel to vessel collision risk;
IV. Wave reflection affecting vessel navigation in normal weather conditions;
V. Vessel allision with lagoon wall in adverse weather; and
VI. Vessel stuck on lagoon wall.

14.5.0.5 These are considered further in the impact assessment that follows for the various phases of the Project.

14.6 Impact Assessment

14.6.1 Impacts during construction

14.6.1.1 A description of the Project and its offshore structures is provided in Chapter 4: Project Description. The offshore works are briefly outlined below.

14.6.1.2 **Offshore works:** The offshore works during the construction and operation phases comprise the following (and their construction): turbines and sluice gates, their housing structure, gantry cranes and other facilities, such as generators and switchgear; temporary cofferdam to facilitate the construction of the turbine and sluice gate housing structure; temporary rock storage areas; seawalls and associated dredging works; dredging to create boating area; access road on the seawalls including public realm works, lighting structures and shelters; Offshore Building incorporating operation and maintenance (O&M) facilities, with integral visitor centre, leisure facilities and public realm; emergency facilities; works to Swansea Port Channel; demolition of existing eastern breakwater wall at the entrance to the Port of Swansea; works to Neath Harbour Channel including the widening of the entrance to the channel and replacement of its training wall; water quality enhancement works (if required or implemented); navigation facilities including lighting; reef habitat creation works, provision of oyster spatting ponds, herring mitigation and Sabellaria habitat works; and necessary services.

14.6.1.3 It is anticipated that dolphin piles will be used to protect the turbine housing during operation and to mitigate the risk to vessels of an allision. If these are utilised, then they will be installed early in the construction phase when the temporary cofferdam is being constructed and thus provide protection throughout the various phases of the Project.

14.6.1.4 It is anticipated that construction will start in 2015 and with the main construction lasting for about three years. Further details of the construction programme are included in Chapter 4. Although the main construction works will take place over 3 years, the actual periods of marine construction will be shorter, generally taking place within the dredging season (March to October).

14.6.1.5 The anticipated number of vessels required for the construction of the Project is presented in Table 14.5. Table 14.5 shows the estimated number of vessels for the installation of the temporary cofferdam which will be undertaken in year 1. Similar vessels will be required for its removal in year 3 of construction.

14.6.1.6 The working area of the vessels associated with the construction of the lagoon seawalls and the actual number of vessels working at any one time will vary depending on which section of seawall is being constructed and what activities are taking place.

Table 14.5 Summary of offshore plant and vessels

Stage/Element of Marine Work	Offshore Plant/Vessels		Originating Location	Anchor Location when not in use
	Type	Anticipated Quantity		
Construction Lagoon Seawalls and Temporary Sand Cofferdam Bund (if this option were chosen)	Cutter dredger or hopper dredger	1 or 2	Rotterdam	During bad weather conditions – Local Port in consultation with the Harbour Master During fine weather conditions – Anchor at sea
	Backhoe dredger	2		
	Split barge	4 to 6		
	Side stone dumping vessel	2		
	Rock barge	4		
	Tug	4 or 5		
	Multicat	1 or 2		
	Survey launch	1		Mooring created within the Lagoon
	Crew launch	1		
	Safety boat	1	UK	Mooring created within the Lagoon
Construction of Temporary Twin Wall Sheet Pile Bund (if this option were chosen)	Jack-up barge	4	UK	Stay in position
	Tug	4		Mooring created within or adjacent to the Lagoon
	Supply/Spud barge	4		
	Work/Dive boat	4		
	Safety boat	3		
	Crew launch	3		
	100t Crawler crane (on jack-ups)	4		On jack-ups
	100t Crawler crane (on completed bund)	2		On completed bund
	30t Excavator	2		
	Wheeled articulated dumpers	4		
	100t Crawler crane (landside in Port)	2		In port

14.6.1.7 Based on the potential hazards identified, the works associated with the construction of the Project and the vessels required, the following potential impacts have been identified for shipping and navigation receptors:

i. Increased vessel to vessel collision risk (including with construction work vessels on site, some of which may be restricted in their ability to manoeuvre);

ii. Additional vessel to structure allision risk with partially constructed structure;

iii. Displacement of pilot vessels/tugs associated with ports in the local area due to construction activities; and

iv. Impact of increased lighting during construction.

14.6.1.8 The potential impact on SAR operations and vessels emergency plans will be relevant for at the final stage of the construction phase when the Lagoon is finally sealed with the completion of the seawalls. Until this time, access will be possible into the waters that will eventually be impounded within the Lagoon. This potential impact is therefore assessed under the operational phase.

14.6.1.9 The following provides details of the assessment undertaken for each potential impact without mitigation. The assessments then outline specific mitigation proposed for the potential impacts identified, and these, together with standard mitigation developed based on the expert opinion of Anatec Ltd. presented in Section 14.8, are used to identify the residual risk. A summary of residual impacts is provided in Section 14.9.

Increased vessel to vessel collision risk

14.6.1.10 During the construction phase of the Project, when the Lagoon seawalls and cofferdam around the turbine and sluice gates will be constructed, there will be an increased risk of vessel to vessel collisions. This is due to vessels being displaced from their normal routes into potentially reduced sea areas, combined with the presence of construction vessels on site. Some of these construction vessels will be restricted in their ability to manoeuvre/adapt (e.g. the dredger). It is expected that a number of vessels will be involved during the construction phase of the Project as detailed in Tables 14.5. There will also be a number of rock barges, which will transport rock for the Lagoon seawalls from Dean Quarry.

14.6.1.11 This potential impact would have a medium level of sensitivity due to the potential for safety impacts and vessels with limited ability to manoeuvre/adapt. The potential impact will also be localised to the extent of the Project area and will be present for the construction period. However, the impact will occur infrequently, which leads to an assessed magnitude of minor negative and an overall ranking of **minor adverse**.

14.6.1.12 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. additional temporary Aids to Navigation (AtoN);

ii. extensive promulgation of information including receptor specific;

iii. appropriate work procedures and planning;

iv. appropriate safety zones around construction works (rolling max 500 metre); and

v. guard vessels in the area of construction works.

14.6.1.13 Following the implementation of mitigation measures, the residual effect will be **minor adverse** (unchanged).

Additional vessel to structure allision risk

14.6.1.14 There will be an increased vessel to structure allision risk during the construction phase of the Project due to the presence of a new structure in a previously open sea area. This risk will be increased if parts of the Lagoon seawall are built below the water line and not adequately marked or lit until fully installed. The risk will also be amplified during times of adverse weather when overtopping or fog may mean the Lagoon seawall is less visible. The greatest risk factor in relation to this impact is the potential effect of a vessel allision with the cofferdam, which will be used for the construction of the turbine housing and sluice gates. This structure will be in place from the first year of construction and may contain up to 500 workers at the peak of its construction.

14.6.1.15 Without mitigation, the potential impact of vessel to structure allision and the limited ability of vessels (particularly larger vessels) to adapt/manoeuvre could present a high level of safety impact if access channels to the ports were restricted, resulting in a sensitivity of high. This potential effect will be localised to the extent of the Project area, which is in close proximity to the Swansea and Neath navigational channels, and present for the construction period, giving a magnitude of moderate negative without mitigation, and a ranking of **major to moderate adverse**.

14.6.1.16 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. additional temporary AtoN;

ii. extensive promulgation of information including receptor specific;

iii. safety zones around construction works;

iv. dolphin piles and floating boom around temporary cofferdam and operational turbine housing and sluice gate structure;

v. guard vessels during the period of construction activity protecting vessels from dangerous areas of the construction; and

14.6.1.17 To protect the turbine and sluice gate structure and to ensure a more visible demarcation, a number of dolphin piles will be installed. These will be placed approximately 500m from the turbine and sluice gate housing on the seaward side of the Lagoon. An indicative arrangement of these is shown below in Figure 14.22. The dolphin piles will be approximately 2m diameter hollow steel piles set 50 to 100m apart. There will be floating booms between the piles and they will be appropriately painted and lit.

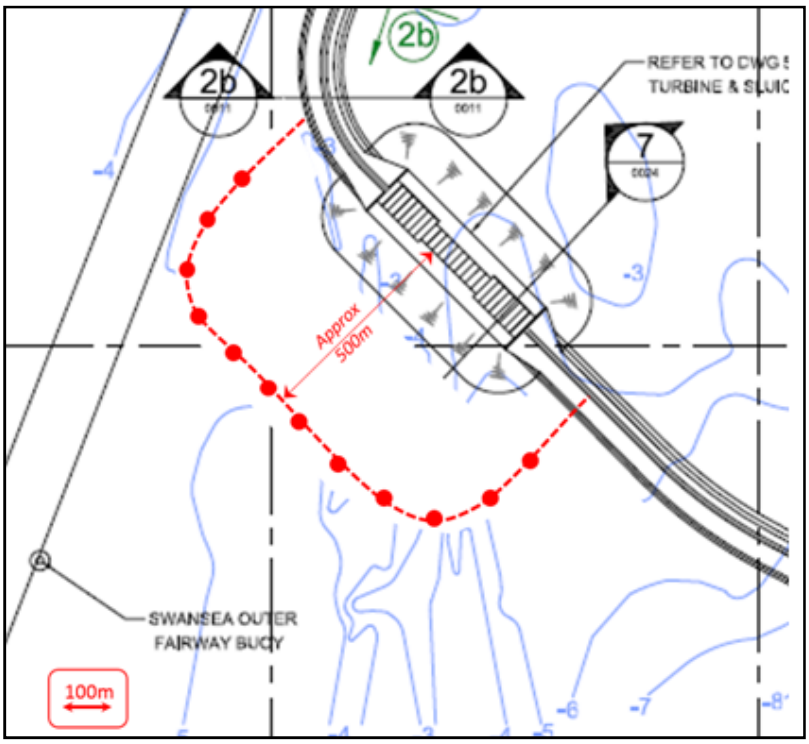

Figure 14.22 Indicative layout of dolphin piles

14.6.1.18 On the lagoon side of the turbines and sluice gate structure there will be a floating boom to demarcate a similar safety zone and an example of these are shown below in Figure 14.23.

Figure 14.23 Example of safety boom proposed

14.6.1.19 Following the implementation of mitigation measures, particularly the use of dolphin piles and floating boom, the residual effect will be **minor adverse**.

Displacement of pilot vessels/tugs

14.6.1.20 Analysis of marine traffic data has identified that the majority of vessels crossing the Project area are pilot vessels and tugs associated with the Ports of Swansea and Port Talbot. The presence of the Lagoon seawall and construction traffic will displace these vessels from their current more direct routes. Furthermore, the Neath Pilot Boarding Station is only 0.1nm at the closest point to the Lagoon seawall (1.6nm from the turbine housing), which could have the potential to impact on pilot vessel operations at this location (i.e. sea room to board).

14.6.1.21 This impact has been assessed to have, without mitigation, a potentially very high level of safety impact due to the restrictions to operations and limited ability to adapt, resulting in a sensitivity of very high. It extends across the extent of Swansea Bay and will be present on a very frequent basis during the construction period (vessels based in Kings Dock, but cross the Lagoon footprint between Ports, resulting in a magnitude of major negative. Overall, the impact without mitigation has been ranked as **major adverse**.

14.6.1.22 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. moving the pilot boarding station further south, in agreement with port operators, to increase distance between pilot boarding station and Lagoon seawalls.

14.6.1.23 Following the implementation of mitigation measures, the residual effect will be **minor adverse.**

Impact of increased lights during construction

14.6.1.24 Although the Swansea Bay and Port area already have night time lighting, during the construction period of the Project, there will be further lights present associated with the Project such as lighting from construction vessels, on structures and other activities. This has the potential to cause visual confusion for vessels coming into Swansea Bay and transiting towards one of the ports.

14.6.1.25 It is anticipated that vessels arriving at the ports will mostly be able to adapt this effect by using other navigational aids, and so the sensitivity is assessed as being low. The impact will be infrequent due to the fact that the temporary cofferdam which will be built for the construction of the turbine and sluice gate housing, will provide a shield around the works. Vehicles will access the construction area along the haul road throughout the construction period and this, together with residual light around the cofferdam, results in a magnitude of moderate negative. Overall, the impact has been assessed as being **minor adverse**.

14.6.1.26 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. adopting work procedures and planning to ensure spurious lighting is shielded from approaching vessels; and

ii. extensive promulgation of information so receptors are fully aware of the construction activities.

14.6.1.27 Following the implementation of mitigation measures, the residual effect will be **minor adverse**.

14.6.2 Impacts during operation and maintenance

14.6.2.1 Chapter 4: Project Description provides details of the components and operation of the Project. Based on the hazards identified during the hazard workshop, consultee input and details of the Project design, operation and maintenance, the following impacts have been identified for shipping and navigation receptors:

i. increased vessel to vessel collision risk;

ii. increased vessel to structure allision risk (including vessels Not Under Command (NUC) and during times of severe adverse weather);

iii. increased vessel to structure allision risk for recreational vessels;

iv. change to transit routes for fishing vessels;

v. change to transit routes for recreational vessels;

vi. impact on persons in water after falling from vessel;

vii. impact on navigable water depth in rivers/channels in the Project area and within the Lagoon;

viii. impact on vessel navigation due to wave reflection (during normal and adverse weather conditions);

ix. impact on SAR operations and vessels emergency plans;

x. impact on the pilot boarding station and the displacement of pilot vessels/tugs associated with ports in the local area; and

xi. impact of Lagoon lighting during operation.

14.6.2.2 The following provides details of the assessment undertaken for each potential impact without mitigation. The assessments then outline specific mitigation proposed for the potential impacts identified, and these, together with standard mitigation developed based on the expert opinion of Anatec Ltd. presented in Section 14.8, are used to identify the residual risk. A summary of residual impacts is provided in Section 14.9.

Increased vessel to vessel collision risk

14.6.2.3 During the operational phase of the Project, with the Lagoon seawalls in place, there will be an increase to vessel to vessel collision risk due to the potential displacement from current routes. This will result in more vessels transiting in a reduced sea area. Although the Lagoon seawalls will not encroach onto the navigational channels there will also be an increased collision risk for those vessels transiting in the channels due to the Lagoon seawall restricting them from taking some of the potential corrective action that they may currently be able take. This risk will be amplified during times of adverse weather.

14.6.2.4 Although all vessels entering and leaving the marina/Swansea Port would be slow moving, there would also be a potential increased risk of collision through the operation of the Lagoon water shuttle. This risk would be minimised through abiding by navigation and operation procedures in this area.

14.6.2.5 Due to the risk of increased collision and allision incidents, there could be an increased need for emergency response actions, when compared to baseline levels. The potential

effects on emergency response actions are dealt with under the operational impact: *Impact on SAR operations and vessels emergency plans* below.

14.6.2.6 Based on the current traffic levels and patterns observed within 5nm of the Lagoon, the number of vessels being displaced is expected to be low, resulting in medium safety impacts and a sensitivity of low. The impact will extend across Swansea Bay and will be present for the lifetime of the project, giving a magnitude of moderate negative and a ranking of **minor adverse**.

14.6.2.7 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. extensive promulgation of information; and

ii. works vessel coordination and guard vessels during major maintenance.

14.6.2.8 Following the implementation of mitigation measures, the residual effect will be **minor adverse** (unchanged).

Additional vessel to structure allision risk

14.6.2.9 The presence of the Lagoon in a previously open sea area has the potential to create additional vessel to structure allision risk. This risk will be increased during times of adverse weather when overtopping or reduced visibility could mean the Lagoon seawall is less visible than usual.

14.6.2.10 Due to the risk of increased collision and allision incidents, there could be an increased need for emergency response actions, when compared to baseline levels. The potential effects on emergency response actions are dealt with under the operational impact: *impact on SAR operations and vessels emergency plans* below.

14.6.2.11 The sensitivity of receptors to this impact has been assessed to be medium. It is localised to the Lagoon seawall but will last the entire lifetime of the project, giving a magnitude of moderate negative and an overall ranking, without mitigation, of **moderate to minor adverse**.

14.6.2.12 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

I. the Lagoon seawalls have been positioned relative to the navigation channels following consultation with ABP and Neath Port Authority. The western Lagoon seawall is positioned 100m from the Tawe dredged channel and the southern Lagoon seawall will abut the Neath dredged channel. The entrance to the Neath channel will be widened;

II. promulgation of information and AtoN;

III. lighting and marking of Lagoon as per Local Lighthouse Authority (LLA) and General Lighthouse Authority (GLA) requirements;

IV. establishment of a safety zone around turbine housing and sluice gate structure;

V. dolphin piles and floating boom around outside of turbine housing and sluice gate structure; floating boom inside Lagoon around turbine housing and sluice gate structure (see construction impact assessed previously: additional vessel to structure allision risk previously)

VI. hydrographic surveys in channels and additional dredging in channels, where necessary, to maintain manoeuvrability;

VII. promulgation of information to notify of any changes in water depth or maintenance dredging taking place; and

VIII. development of procedures for reducing the increased risk caused by significant adverse weather.

14.6.2.13 Following the implementation of mitigation measures, including the installation of dolphin piles and the floating boom around the operational turbine and sluice gate housing, the residual effect will be **moderate to minor adverse** (unchanged).

Additional vessel to structure allision risk for recreational vessels

14.6.2.14 The presence of the Lagoon in a previously open sea area has the potential to create an additional recreational vessel to structure allision risk. This risk will be increased during times of adverse weather when overtopping or fog could mean the Lagoon seawall is less visible than usual. The risk is potentially greater for recreational vessels as they are more likely to be transiting closer to the Lagoon (i.e. outside the Swansea channel) and more likely to be severely damaged or become stuck, if an allision incident was to occur.

14.6.2.15 The sensitivity of receptors to this impact has been assessed to be high. It is localised to the Lagoon seawall but will last the entire lifetime of the project, giving a magnitude of minor negative and an overall ranking of **minor adverse**.

14.6.2.16 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. the Lagoon seawalls have been positioned following consultation with ABP and Neath Port Authority. The entrance to the Neath channel will be widened;

ii. extensive promulgation of information;

iii. lighting and marking of Lagoon as per LLA and GLA requirements;

iv. dolphin piles and floating boom around the outside of the turbine housing and sluice gate structure and floating boom within the Lagoon; and

v. coordination with event organisers to ensure site support vessels during busy periods (e.g. sporting events).

14.6.2.17 Following the implementation of mitigation measures, the residual effect will be **minor adverse** (unchanged).

Change to transit routes for fishing vessels

14.6.2.18 Analysis of marine traffic data and sightings/satellite data has identified that the majority of fishing vessels in the vicinity of the Project transit in and out of the Swansea channel and do not cross the Project area. Any vessels which would cross the Project area at present will be impacted and will have to deviate to avoid the site, which would result in increased voyage times and fuel costs.

14.6.2.19 Due to the relatively low level of commercial fishing activity in the area and the fact that few fishing vessels cross the Project area (the majority appear to head west from the Bay), the sensitivity has been assessed as being low. The impact is localised to the

geographical extent of the Project area and out of the direct line of more frequently used routes, although it will be present for the lifetime of the project which results in a magnitude of moderate negative. Overall the impact has been assessed as being **minor adverse**.

14.6.2.20 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

I. promulgation of information to fishing receptors, including Notices to Mariners and Notices to Fishermen.

14.6.2.21 Following the implementation of mitigation measures, the residual effect will be **minor adverse** (unchanged).

Change to transit routes for recreational vessels

14.6.2.22 Analysis of marine traffic data and RYA cruising routes indicate that there is recreational traffic around the Project area, but the traffic does not generally transit through the Project area itself. Any recreational vessels which currently use a route that crosses the Project area will be required to deviate once it is built, resulting in increased voyage times and fuel costs.

14.6.2.23 Due to the fact that recreational vessels have not been observed regularly crossing the Project area, the sensitivity has been assessed as being low. The impact is localised to the geographical extent of the Project area and out of the direct line of more frequently used routes, although it will be present for the lifetime of the project which results in a magnitude of moderate negative. Overall the impact has been assessed as being **minor adverse**.

14.6.2.24 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. promulgation of information to recreational receptors, including contacting local clubs and marinas, who can pass the information on to their members.

14.6.2.25 Following the implementation of mitigation measures, the residual effect will **be minor adverse** (unchanged).

Impact on persons in the water after falling from vessel

14.6.2.26 The presence of the Project in proximity to marine traffic means that there is a potential risk that people may enter the water, either accidentally or intentionally, in proximity to the turbine and sluice gate housing.

14.6.2.27 Due to the level of the impact the sensitivity has been assessed as being high. The impact is localised to the geographical extent of the turbine and sluice housing. It will be present for the lifetime of the project, but would be infrequent in occurring, which results in a magnitude of moderate negative. Overall, the impact has been assessed as being **major to moderate adverse,** without mitigation.

14.6.2.28 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. Access and boat platform outside turbine safety zone, with inside the lagoon wall a jetty/floating pontoon and steps;

ii. marked safety zone around turbines (floating boom inside Lagoon, dolphin piles and floating boom outside Lagoon);

iii. extensive promulgation of information to receptors;

iv. AtoN, where appropriate;

v. coordination with the event organiser to ensure site support vessels during busy periods (eg sporting events);

vi. develop emergency shutdown procedure for turbines, from manned facility on turbine housing;

vii. quick response time for shutting down turbines;

viii. enforcement of wearing lifejackets for relevant activities within the Lagoon.

14.6.2.29 Following the implementation of mitigation measures, the residual effect will be **minor adverse**.

Impact on navigable water depth

14.6.2.30 There is a potential for changes in current coastal processes resulting from the operation of the Project to cause increased siltation in channels and within the Project area which would impact on the water depth available for safe navigation. At present, the channels are maintained at the following depths: Swansea 4.2m (below chart datum) in the entrance channel, Port of Neath 2.0m (above chart datum) in the entrance channel and Port Talbot 11.2m (below chart datum).

14.6.2.31 The Project is predicted to potentially increase average annual maintenance dredge volumes by 20 to 34% along the Swansea Channel, and by 1.2 to 2.0% at Port Talbot (along the approach channel and within the Outer Harbour - although it is considered that this predicted change in deposition will be generally indistinguishable from the natural variation in annual dredge volumes) The ranges of potential annual sedimentation have been calculated based upon measured summer/ winter sedimentation variability within the channels as part of the coastal processes assessment (Chapter 6 of the Environmental Statement). As shown in Figure 6.50 (Volume 2), the majority of the increased Swansea dredging would need to be undertaken within the inshore half of the channel, whilst increases within the Port Talbot approach channel is predominantly within patches along its length. It should be emphasised, however, that these predicted potential changes to maintenance dredging are based upon average annual dredging rates, therefore these changes will be considerably less during years when the existing maintenance dredging requirements within the channels is considerably greater.

14.6.2.32 Siltation is also predicted within the Lagoon. It is anticipated that maintenance dredging within the Lagoon will not need to start until 10 to 15 years after the completion of construction and then be performed approximately every two years. However, the need to do so will be monitored. Based on this monitoring a dredging strategy will be developed and a licence for disposal will be discussed and agreed with the Marine Licensing Team.

14.6.2.33 It has been assessed that shipping and navigation receptors will have a medium sensitivity towards this impact (Appendix 14.2 Hazard log). The potential siltation will be present within areas along the extent of Swansea channel and Port Talbot channel for the lifetime of the project and could be frequent in occurrence, resulting in a magnitude of moderate negative and an overall ranking, without mitigation, of **moderate to minor** adverse.

14.6.2.34 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

I. maintenance dredging in the channels and the Lagoon when required;

II. regular hydrographic surveys in the channels; and

III. promulgation of information to notify of any changes in water depth or maintenance dredging taking place.

14.6.2.35 Following the implementation of mitigation measures, the residual effect will be **insignificant**.

Impact on vessel navigation due to wave reflection

14.6.2.36 Wave reflection from the Lagoon seawall could have a potential impact on vessels within the vicinity of the Project. This impact could have safety implications and could be amplified during times of adverse weather.

14.6.2.37 In addition, the influence of increased flows arising from operation of the turbine and sluice gates has also been considered in relation to its potential effects on navigation. The influence of the lagoon development on tidal flows has been modelled within the coastal processes chapter (chapter 6). It is recognised that any flow may influence and therefore affect the navigational safety of the nearby channel. Flood and ebb flow rates for the channel are noted within Table 14.6, below. At 500m distant from the turbine house, within Swansea channel, flows are predicted to be a maximum of 2.33 knots, for a period spanning 15 minutes. Consultation with an experienced master mariner operating locally indicates that a vessel may generally experience a rate of 1.5 knots across the channel. This is supported by data recorded during the metocean survey (Titan, 2012) where a maximum baseline flow of 0.52m/s (1 knot) was recorded at the offshore survey site (site 2) which is located to the east of the turbine and sluice gate house. Baseline flows increase to the west of the turbine and sluice gate house as shown on Figure 6.4, Volume 2. The difference in speed and time span duration, that this maximum predicted flow would be experienced for, indicates that this would not present an impact to vessels already safely navigating in the flows currently experienced across the Swansea Channel. Micro-siting of the turbine and sluice gate housing further south east would further reduce the effect of the flows from the operation of the lagoon on the Swansea Channel.

Table 14.6 Predicted flows within Swansea channel in the vicinity of the turbines

Location	Flood Current Speed (Knots)	Ebb Current Speed (Knots)
Swansea Channel - Nearest point (500m) from turbine housing	< 0.5 knots*	2.33 knots*
Swansea Channel - Directly opposite (950m) from turbine housing	<0.5 knots*	2.19 knots*

* Worst case estimates, this peak spans only 15 minutes.

14.6.2.38 Design wave conditions have been assessed at various locations along the Lagoon seawall. Information with respect to climate change and resulting sea level rise has also been taken into account. The walls of the lagoon will be designed with a reflection coefficient in the region of 0.3 reflection for the exposed western arm of the seawall (absorbing 70% of the wave energy), running out to the turbine and sluice gate house, and 0.4 for the eastern seawall, running from the turbine and sluice gate house along the Neath channel. The sloping walls and rock armour of the lagoon seawalls will assist in absorbing wave energy, and reduce wave reflection when compared to vertical walls. The vertical walls of the turbine and sluice housing structure will produce some additional wave reflection.

14.6.2.39 Modelling of the waves has been undertaken in Chapter 6. The results show that for a 10 in 1 year wave event arriving from the SW (the predominant wave direction into Swansea Bay), the presence of the Lagoon structure leads to an increase in wave height of up to 0.22 m off the south-western facing side of the Lagoon (Figure 6.44, Volume). These increases are predominantly the result of wave reflection against the seawall and turbine/sluice gate housing. Within the Swansea Channel there is slight increase in waves at the offshore extreme, for a relatively small area. The waves are then predicted to be similar to the baseline, before the sheltering effect of the Lagoon reduces wave heights in the channel for approximately the last 2km of approach to the Tawe. To the east of the Lagoon, decreases in significant wave height of up to 0.5m are predicted immediately in the lee of the Lagoon across the intertidal fronting Crymlyn Burrows (north side of the Neath Channel) for a 1 in 10 year event; particularly in the vicinity of the Monkstone Light. This change decreases to less than 0.2m at a distance of approximately 1.3 km from the structure, i.e. within the entrance of the Neath Channel, as the sheltering effect diminishes radially.

14.6.2.40 Under south east wind conditions the sheltering effect of the Lagoon on the Swansea Channel is more pronounced (Figure 6.48, Volume 2). The channel has reduced wave height *circa* 0.2 to 0.5m (for a 10 in 1 year event) found along the inner section of the Swansea Channel; with this reduction increasing to approximately 0.5 to 1.2m for a 1 in 10 year extreme wave event (Figure 6.49, Volume 2). In the Neath Channel under south east wind conditions (for a 10 in 1 year event) there is predicted to be no significant change with a 0.04m height increase in the offshore section and a -0.01m change in the inner part of the channel. Overall the effect of the Lagoon will not significantly affect the approaches to either channel and in fact the Lagoon will afford some sheltering to the Tawe approach under SW and SE wind conditions.

14.6.2.41 The safety impacts due to wave reflection are low and vessels can adapt to the impact by increasing their distance from the Lagoon seawall, resulting in a sensitivity of medium. The impact has the potential to affect vessels beyond the Project area and will occur

frequently giving a magnitude of moderate negative. Overall, without the embedded mitigation of wave reflection designed into the Project, the impact has been ranked as moderate to minor adverse.

14.6.2.42 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

i. wave reflection has been considered in the design of the Lagoon seawall.

14.6.2.43 Following the implementation of mitigation measures, the residual effect on navigation as a result of wave reflection will be **minor adverse** in the outer reaches of the Swansea channel, with **minor beneficial** effects elsewhere in sheltered areas of the Neath and Swansea channels.

Impact on search and rescue operations and vessels emergency plans

14.6.2.44 Emergency response cover within the Swansea Bay area is currently provided by RNLI lifeboats from The Mumbles and Port Talbot, with SAR helicopters based at Chivenor (changing to St Athan between 2015 and 2017). Vessels undertaking emergency response operations will be unable to access casualties within the Project area by the quickest route which would lead to a slower response time. Also, due to the aforementioned risk of increased collision and allision incidents, there could be an increased need for emergency response actions, when compared to baseline levels.

14.6.2.45 This impact has a high level of safety impact (for example, if an accident occurs within the Lagoon and the RNLI was unable to quickly access the area) and receptors have a limited ability to adapt, resulting in a sensitivity of high. It will be present for the lifetime of the Project and cover the extent of Swansea Bay. Analysis of RNLI and MAIB data has indicated that emergency response actions within the bay are relatively frequent, but within the Project area are infrequent, resulting in a magnitude of moderate negative. Overall, without mitigation, the impact has been assessed as being **major to moderate adverse**.

14.6.2.46 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measures:

I. a slipway with emergency response RIB within the Lagoon;

II. coordination with events organisers to ensure site support vessels during sporting events; and

III. consultation with emergency responders and provision of an Emergency Response Cooperation Plan (ERCoP).

14.6.2.47 The local RNLI stations and HMCG will be consulted about the devices to be deployed (i.e. the turbines and sluice gates) and provided with any further information requested to assist SAR efforts. This will include:

i. precise location details;

ii. device details and illustrations;

iii. information on the emergency stop procedure/timings;

iv. information on the buoyancy of device parts; and

v. emergency contact details.

14.6.2.48 An ERCoP is proposed as part of the SAR liaison process for the Project which will be developed and agreed with the MCA prior to the operation phase[2].

14.6.2.49 Following the implementation of mitigation measures, the residual effect will be **minor adverse.**

Impact on pilot boarding station and displacement of pilot vessels/tugs

14.6.2.50 The presence of the Lagoon will displace pilot vessels and tugs which currently transit in a direct line between Swansea and Port Talbot. This will increase journey times and may therefore have commercial implications. The Neath Pilot Boarding Station, which is located approximately 0.45nm from the Lagoon seawalls, may also be impacted.

14.6.2.51 This impact has been assessed to have a very high level of safety impact, resulting in a sensitivity of very high. It extends across the extent of Swansea Bay and will be present on a very frequent basis for the duration of the project, resulting in a magnitude of major negative. Overall, without mitigation, the impact has been ranked as **major adverse**.

14.6.2.52 Standard mitigation measures, outlined in Section 14.8, will be implemented, together with the following specific measure which has been incorporated within the Project design:

i. pilot boarding station moved further south to increase distance between the pilot boarding station and Lagoon seawall.

14.6.2.53 Following the implementation of mitigation measures, the residual effect will be **minor adverse**.

Impact of lagoon lighting during operation

14.6.2.54 Permanent lighting associated with the Project could have a potential impact by creating visual confusion for vessels coming into Swansea Bay and transiting towards one of the ports.

14.6.2.55 Lighting has been designed for the Project with consideration given to shipping and navigation receptors and to ensure that spurious white lights do not impact on a vessels ability to navigate. In addition, the Lagoon will be lit and marked during operation in line with THLS guidance.

14.6.2.56 It is anticipated that vessels will be able to adapt to the effect of lighting on the Lagoon by using other navigational aids, which will result in a low sensitivity. The impact will be frequent, last for the lifetime of the Project and cover the extent of Swansea Bay, resulting in a magnitude of moderate negative. Overall, the risk has been assessed as being **minor adverse**, with the residual impact remaining as **minor adverse**.

[2]http://www.dft.gov.uk/mca/mcga07-home/shipsandcargoes/mcga-shipsregsandguidance/offshore-renewable_energy_installations/dops_-_all-newpage-26.htm

14.6.3 Impacts during decommissioning

14.6.3.1 In terms of decommissioning, as identified in Chapter 4, Project Description, at the end of the operational life of the Project (estimated at some 120 years) two potential options are under consideration:

I. to replace, upgrade and extend the operational life of the power generating station (in which case, the above impacts could be expected to continue); and

II. removal of the turbines and sluice gates from the turbine/sluice gate housing to leave the openings, through which the natural tide will flow.

14.6.3.2 If the second option were progressed removal work will be undertaken within the confines of the turbine and sluice gate housing using the gantry crane and thus marine works are not anticipated. Vessels may then be able to access the lagoon for recreational and fishing use.

14.6.3.3 In respect of the first option, the impacts will continue as for the general operational and maintenance phase assessed above. In respect of the second option, access to the lagoon may be feasible for fishing or recreation vessels through the opening in the seawall which previously housed the turbines and sluice gates. Impacts will also be similar to those identified for the operational phase, except that changes in hydrodynamics (e.g. increased flows) which resulted from the operation of the turbines will be reduced. However, impacts will remain in respect of changes in navigational depths, particularly within the lagoon, as it is anticipated that maintenance dredging would still be required to retain use of the area for recreational sailing and sporting events. The same mitigation measures will apply as described previously.

14.7 Cumulative impacts

14.7.0.1 Based on the projects identified as relevant to cumulative/in-combination assessment in Chapter 2 of this Environmental Statement, the following activities and projects have been identified as having the potential to interact with the Project in respect of shipping and navigation:

i. Port Talbot Harbour Redevelopment;

ii. Underground Coal Gasification (under Swansea Bay); and

iii. Navigational Dredging.

14.7.0.1 Table 14.7 describes the potential cumulative and in-combination impacts for shipping and navigation.

Table 14.7 Cumulative

Cumulative Impact	
Atlantic Array Offshore Wind Farm (Round 3)	**Not Considered** since the project is not proceeding.
Port Talbot Harbour Redevelopment	Potential future activities associated with the redevelopment of the harbour, the current status of which is unknown. If this takes place then some changes in traffic would be anticipated. However, while there is no information currently available, an assessment cannot be undertaken at this stage.

Cumulative Impact	
Underground Coal Gasification (under Swansea Bay)	The development's provisional license has been extended, but at this early stage no further information is available. Therefore, no cumulative impact assessment can be undertaken at this time.
Navigational Dredging	Channel dredging for the Tawe, Neath and Port Talbot. Access dredging at Swansea Marina and Monkstone Cruising and Sailing Club. Also existing/proposed dredging in the Bristol Channel. The status of these is on-going. The current level of dredging traffic is known, having been assessed within the marine traffic assessment and survey.
Ro-Ro Ferry	**Not Considered**: Ferry not anticipated to recommence in the foreseeable future. No cumulative assessment undertaken. However, use of Port of Swansea generally is considered in this NRA and Chapter 14, Navigation and Marine Transport.

14.8 Review of mitigation measures

14.8.0.1 Specific mitigation measures have been identified for the potential effects predicted in Section 14. In addition to these specific measures, a number of standard mitigations have been identified by Anatec Ltd. as relevant for the Project based on their expert opinion. These standard mitigation measures are presented below:

i. application and use of safety zones around construction works and operational turbines and sluice gate housing;

ii. ensuring compliance with International Maritime Organisation Conventions;

iii. adopting emergency response and co-operation plan;

iv. ensuring compliance with International Association of Lighthouse Authorities (IALA) Guidance and Aids to Navigation (AtoN);

v. adopting marine pollution contingency planning (see Chapter 7 Marine Water Quality);

vi. Compliance with MGN 371;

vii. Personal Protective Equipment;

viii. Standard promulgation of information;

ix. Use of guard vessels during construction; and

x. Development charting – e.g. structures associated with the Project to be marked on navigational and Admiralty Charts.

14.8.0.2 Construction safety will be detailed within a Construction Code of Conduct/Health, Safety and Environmental Management Plan (HASEMP). Safety boats will be available during all marine works. An Operational Environmental Management Plan will be prepared for the operational phase of the Project (see Chapter 4: Project Description).

14.8.0.3 When determining safety zones for construction and operation, minimum safety zones are required to ensure the safety of working vessels and other shipping. These will be implemented based on consultation with MCA and local stakeholders (e.g. port and marina authorities).

14.8.0.4 It is expected that the safety zone applied for will be up to a 300m around construction activities and some construction vessels during the construction phase. For working

vessels, the safety zones would only apply temporarily during activity on site when the vessels are restricted in manoeuvrability. This will be indicated on the vessels by their display of appropriate marks and lights, and by the vessels updating their navigational status on AIS.

14.8.0.5 To minimise any impacts, procedures will be in place to ensure that working vessels do not restrict passing traffic and local vessels when not actively engaged in working on the construction site. If it is not practicable for the working vessel to depart from the construction site in between operations, the vessel would use appropriate day marks and lights, and update its status on AIS. This would indicate to passing vessels that the vessels were not restricted in manoeuvrability and hence any safety zone would not be operational at that time.

14.8.0.6 During construction activity, information will be circulated to local stakeholders to ensure that they are kept informed of the activity on a day-to-day basis. This will be achieved by setting up a contact list for distributing this information. Various measures area available and will be used as appropriate:

I. Navtex (navigational telex);

II. Notices to Mariners;

III. Coastguard Marine Safety Information broadcasts;

IV. Fishermen's awareness charts (issued by Kingfisher Information Services);

V. Updated Sailing Directions; and

VI. Port Notices and Liaison with Harbour Masters.

14.8.0.7 The proliferation of AtoN will be avoided by consulting with THLS in relation to those currently used within the Bay, for both the temporary AtoN during the construction phase and the permanent AtoN during the operational phase of the Project.

14.9 Residual Impacts

14.9.0.1 This section presents the residual impacts following implementation of mitigation measures for significant impacts on shipping and navigation identified for the construction (Table 14.8), operational and decommissioning (Table 14.9) phases of the Project.

14.9.0.2 It is worth noting that some residual impacts remain unchanged from the initially assessed impact. While this may appear to offer no actual change to the impact through mitigation, in actual fact the impact is reduced and made safer by the mitigation measures. But the residual impact is still assessed as having an impact that, when measured by the sensitivity and magnitude matrixes, warrants classification within the result it previously held. So while the impact is safer by a number of degrees, it may still be classified at the same level.

Table 14.8 Residual impact construction

Impact	Impact Significance pre mitigation	Mitigation (see section 9.7 for further information)	Residual Impact
Increased vessel to vessel collision risk - with work vessels or with displaced vessels	Minor adverse	Additional AtoN, work procedures and planning with respect to other users in the bay, promulgation of information Notice to Mariners (NtoM), guard vessel; appropriate safety zones during construction.	Minor adverse (Unchanged)
Additional vessel to structure allision risk	Major to moderate adverse	Additional AtoN, promulgation of information, appropriate safety zones, dolphin piles and floating boom around temporary cofferdam, guard vessel on site during construction.	Minor adverse
Displacement of pilot vessels/tugs	Major adverse	Maintain access to Ports along navigation channels. Move pilot boarding station slightly further south in consultation with relevant harbour authorities to increase distance between pilot boarding station and lagoon wall.	Minor adverse
Impact of increased lights during construction	Minor adverse	Work procedure and vessel planning to ensure spurious lighting is shielded from approaching vessel, promulgation of information.	Minor adverse (unchanged)

Table 14.9 Residual impact operation and decommissioning (removal of turbines and sluice gate structure)

impact	Impact significance pre-mitigation	Mitigation (see section 9.7 for further information)	Residual Impact
Increased vessel to vessel collision risk	Minor adverse	Promulgation of information, works vessel co-ordination and guard vessels during any offshore maintenance works.	Minor adverse (unchanged)
Additional vessel to structure allision risk	Moderate to minor adverse	Positioning of Lagoon seawalls in agreement with Port Authorities. Lighting and marking of Lagoon, promulgation of information, additional AtoN, development of procedures for adverse weather, safety zone around turbine/ sluice gate housing, dolphin piles and floating boom around outside of turbine/ sluice gate housing, floating boom inside Lagoon around turbine/sluice gate housing, additional maintenance dredging of channels where necessary.	Moderate to minor adverse (unchanged)
Additional vessel to structure allision risk for recreational vessels	Minor adverse	Positioning of Lagoon seawalls in agreement with Port Authorities. Lighting and marking of Lagoon, promulgation of information, safety zones around turbine/sluice gate structure, dolphin piles and floating boom around outside of turbine/ sluice gate housing, floating boom inside Lagoon around turbine/sluice gate housing coordination with event organiser to ensure site support vessels during busy periods (e.g. sporting events).	Minor adverse (unchanged)

impact	Impact significance pre-mitigation	Mitigation (see section 9.7 for further information)	Residual Impact
Change to transit routes for fishing vessels	Minor adverse	Promulgation of information to specific receptors.	Minor adverse (Unchanged)
Change to transit routes for recreation vessels	Minor adverse	Promulgation of information to specific receptors.	Minor adverse (Unchanged)
Impact on persons in the water after falling from vessel	Major to moderate adverse	i. Access and boat platform outside turbine safety zone, with inside the lagoon wall a jetty/floating pontoon and steps ii. Marked exclusion area around turbines (floating boom inside Lagoon, dolphin piles and floating boom outside Lagoon) iii. Extensive promulgation of information iv. Additional aids to navigation v. Develop emergency shutdown procedure for turbines, from manned facility on turbine housing vi. Quick response time for shutting down turbines vii. Coordination with event organiser to ensure site support vessels during busy periods (e.g. sporting events); viii. Enforcement of wearing lifejackets for relevant activities within the Lagoon.	Minor adverse
Impact on navigable water depth - silting in channels or within lagoon boundary because of a change in current patterns	Moderate to minor adverse	maintenance dredging in channel and lagoon when required, hydrographic surveys, promulgation of information about any water depth changes	Insignificant
Impact on vessel navigation due to wave reflection.	Moderate to minor adverse	The walls of the lagoon have been designed with an appropriate reflection coefficient to minimise wave reflection	Minor adverse to minor beneficial
Impact on search and rescue operations and vessels emergency plans	Major to moderate adverse	Slipway within lagoon, consultation with emergency responders, ERCoP, coordination with event organiser to ensure site support vessels during sporting events.	Minor adverse
Impact on pilot boarding station and displacement of pilot vessels/tugs	Major adverse	Move pilot boarding station slightly further south in consultation with relevant harbour authorities to increase distance between pilot boarding station and lagoon wall.	Minor adverse
Impact of Lagoon lighting during operation	Minor adverse	Lighting has been designed with consideration given to shipping and navigation.	Minor adverse (Unchanged)

14.10 Conclusion

14.10.0.1 This Chapter presents the assessment carried out for the construction, operation and decommissioning phases of the Project on shipping and navigation receptors. The baseline environment concerning navigation and marine traffic within the Swansea Bay area has been determined using 56 days of AIS data (summer and winter) and 14 days of marine traffic survey, capturing AIS, radar and visual observation data. Relevant guidance and information published by industry bodies and stakeholders has also been reviewed. Further details of the baseline environment are provided in the NRA presented in Appendix 14.1, Volume 3.

14.10.0.2 The baseline environment information, including information provided by relevant stakeholders, has informed the identification of potential impacts concerning the Project.

14.10.0.3 Four impacts were identified for the construction phase and eleven impacts identified for the operation and decommissioning phases of the Project. The identification of mitigation measures, both those recommended by industry bodies and those enhanced by best practice are outlined in the assessment. Following implementation of appropriate mitigation, the residual impacts were reduced to one insignificant impact, thirteen minor adverse and one moderate to minor adverse (allision). This demonstrates that the application of mitigation measures would reduce impacts of the Project on navigation receptors to a level where the risk is acceptable for the fifteen impacts.

14.10.0.4 In accordance with Maritime and Coastguard Agency practices, a NRA has been prepared (Appendix 14.1, Volume 3) and also a checklist for the satisfactory completion of the NRA which is presented within Appendix 14.3, Volume 3. All areas, as outlined by the MCA guidance, have been completed within the NRA.

14.11 References

MCA (2008). Marine Guidance Notice 371, Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues. London: MCA.

RYA (2012) The RYA's Position on Offshore Energy Developments: Paper 3 – Tidal Energy.

DECC (2005) in association with MCA. Guidance on the Assessment of Offshore Wind Farms - Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farm.

United Kingdom Hydrographic Office (UKHO) (2011). Admiralty Sailing Directions – West Coasts of England and Wales Pilot. Taunton: UKHO.

RYA (2009). UK Coastal Atlas of Recreational Boating. Updated 2008. Southampton: RYA. GIS Shapes files dated 2010.

IALA (2008). O-139 The Marking of Man-Made Offshore Structures. Edition 1. Saint Germain en Laye, France: International Association of Marine Aids to Navigation and Lighthouse Authorities.

The Planning Inspectorate (November 2012) Scoping Opinion Proposed Tidal Lagoon Swansea Bay. http://infrastructure.planningportal.gov.uk/wp-content/ipc/uploads/projects/EN010049/1.%20Pre-Submission/EIA/Scoping/Scoping%20Opinion/121121_EN010049_Scoping%20Opinion_Tidal%20Lagoon%20Swansea%20Bay.doc.pdf

Titan, 2012. Swansea Bay Tidal Lagoon – Current/Wave Monitoring: Final Overview Report. Titan Environmental Surveys Ltd, Report CS0343.

TLSB (2012) Proposed Tidal Lagoon Development in Swansea Bay, South Wales, Environmental Impact Assessment Scoping Document (http://infrastructure.planningportal.gov.uk/wp-content/ipc/uploads/projects/EN010049/1.%20Pre-Submission/EIA/Scoping/Scoping%20Request/EN010049_Tidal%20Power%20Swansea%20Bay%20Scoping%20Document%20Final%20reduced%20size.pdf)
TLSB (2013) Preliminary Environmental Information Report.

UKHO, 2011. *Admiralty Sailing Directions NP37 West Coasts of England and Wales Pilot, 18th Edition.* Taunton: The United Kingdom Hydrographic Office.