Chapter 17 Shipping and Navigation

17.1 Introduction

1 This chapter summarises the work undertaken as part of the Navigational Risk Assessment (NRA) to identify the baseline vessel activity and navigational features in the vicinity of the proposed Neart na Gaoithe offshore wind farm located in the outer Firth of Forth on the east coast of Scotland.

2 In carrying out the assessment; recreational sailing data, maritime incidents, fishing sightings/surveillance data and shipping survey data recorded in the area were used to identify the navigational baseline activity relative to the Neart na Gaoithe offshore wind farm.

17.2 Guidance and Legislation

17.2.1 Primary Guidance

3 The primary guidance used during this assessment was the Maritime and Coastguard Agency (MCA) Marine Guidance Notice (MGN) 371 (Merchant and Fishing *'Offshore Renewable Energy Installations (OREIs)*) - *Guidance on UK Navigational Practice, Safety and Emergency Response Issues'* (MCA, 2008a).

4 MGN 371 highlights issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments, proposed for United Kingdom (UK) internal waters, territorial sea or Renewable Energy Zones.

5 There are five annexes containing recommendations and regulatory extracts as follows:

- Annex 1: Considerations on site position, structures and safety zones;
- Annex 2: Navigation, collision avoidance and communications;
- Annex 3: MCA template for assessing distances between wind farm boundaries and shipping routes;
- Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning; and
- Annex 5: Standards and procedures for generator shutdown and other operational requirements in the event of a search and rescue, counter pollution or salvage incident in or around an OREI.

17.2.2 Other Guidance

6 Other forms of guidance used in this assessment are listed as follows:

- MCA MGN 372 (Merchant and Fishing) 'OREIs Guidance to Mariners Operating in the Vicinity of UK OREIs' (MCA, 2008b) – Section 2.7 'Effects of Wind Farms and Wind Turbines on routeing options' and Section 4 'Safety Zones or Exclusion Zones';
- Department of Environment and Climate Change (DECC) 'Applying for safety zones around offshore renewable energy installations - Guidance Notes' (DECC, 2011);
- MCA 'Search and Rescue Framework for the united Kingdom of Great Britain and Northern Ireland', (MCA, 2008c) – Part 2, Chapter 1 'MCA' and Chapter 4 'Royal National Lifeboat Institution (RNLI)'; and
- International Maritime Organisation (IMO), 'Guidelines for Formal Safety Assessment (FSA) for use in the IMO Rule-Making Process' (IMO, 2002).

17.2.3 Review Process

7 The Department of Trade and Industry (DTI) (now Department for Business, Innovation and Skills (BIS)), in association with the MCA and the Department for Transport (DfT), produced '*Guidance on the Assessment of the Impact of Offshore Wind Farms: Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms*' to provide a template for developers in preparing their NRA. The methodology is centred on risk controls and the feedback from risk controls into risk assessment. It requires a submission that shows sufficient risk controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with further controls or actions. The NRA methodology principally follows the DTI/DfT/MCA template, as presented in report (Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment).

17.3 Data Sources

8 This section summarises the main data and reference sources used in assessing the baseline shipping activities relative to the Neart na Gaoithe offshore wind farm. The main data sources and references used in this assessment are listed below and discussed in detail in the following sections:

- Automatic Identification System (AIS) and radar survey data obtained from a survey carried out from a geotechnical survey vessel (2010);
- Forth and Tay Offshore Wind Developers Group (FTOWDG) AIS data (November 09 to May 2010) and (November 10 to July 2011) from coastal survey sites;
- Fishing surveillance satellite data (2006 and 2008) and overflight data (2005-09);
- Maritime incident data from the Maritime Accident Investigation Branch (MAIB) (2001-2010) and RNLI 2001-2010;
- Marine aggregates dredging data from The Crown Estate and British Marine Aggregates and Producers Association (BMAPA);
- UK Admiralty Charts;
- Admiralty Sailing Directions (NP 54) North Sea (West) Pilot (United Kingdom Hydrographic Office (UKHO)), (2009);
- International Association of Lighthouse Authorities (IALA) Recommendations 0-139 (The Marking of Man-Made Offshore Structures, Edition 1) (IALA, 2008);
- North Hoyle Radar Trials (MCA, 2005) and (QinetiQ and MCA, 2004); and
- Kentish Flats Radar Trials (British Wind Energy Association (BWEA), now Renewable UK (RUK), 2007).

17.3.1 Desk Study

17.3.1.1 Shipping Data

9 The main information on baseline navigation in the area came from a combined dataset including 29 days of AIS and radar data (21 days of non-AIS vessel tracks) recorded from a geotechnical survey vessel working at Neart na Gaoithe during August to October 2010

10 Longer term AIS shipping data were also analysed from coastal AIS surveying by FTOWDG for seven months from November 2009 to May 2010 and for nine months from November 2010 to July 2011.

11 AIS is required to be fitted aboard all ships engaged on international voyages of 300 gross registered tonnage (grt) and upwards, cargo ships of 500 grt and upwards not engaged on international voyages and passenger ships (carrying 12 or more passengers) irrespective of size, built on or after 1 July 2002. Fishing vessels over 45 m are required to carry AIS; however phased European Union (EU) legislation will result in all fishing vessels of 15 m or over having AIS installed by 2014.

12 As a result of these requirements, only larger vessels (i.e., commercial vessels over 300 grt) were recorded on AIS, while smaller vessels without AIS installed (i.e., fishing vessels under 45 m and recreational craft) were recorded on the Automatic Radar Plotting Aid (ARPA) onboard the survey vessel. It should be noted that the up-take of AIS by smaller craft including yachts and fishing vessels (under 45 m) has increased over the last few years due to less expensive forms of AIS becoming available including Class B AIS. Class B AIS is a lower power alternative to Class A, which broadcasts at a lower rate and has a lower detection range.

17.3.1.2 Recreational Data

13 The Royal Yachting Association (RYA), supported by the Cruising Association (CA), has identified recreational cruising routes, general sailing and racing areas for UK waters.

14 This work was based on extensive consultation and qualitative data collection from RYA and CA members. Consultation was also carried out with berth holder associations and marinas. The results of this work were published in 'Sharing the Wind' (RYA, 2004) and updated Geographical Information System (GIS) layers (2010) from the RYA UK Coastal Atlas of Recreational Boating have been used in this study.

17.3.1.3 Aggregates Data

15 Commercial aggregates dredging was screened out at the scoping stage given the nearest licence and active areas are located approximately 180 nautical miles (NM) south-southeast on the approaches to the River Humber.

17.3.1.4 UK Admiralty Charts

16 Admiralty charts are nautical charts issued by the UKHO and are subject to Crown Copyright. The charts have been used to consider approaches and entrances to ports and harbours in the area and identify navigational features. The following are the main charts used in this study:

- 1407 – Montrose to Berwick-upon-Tweed;
- 1409 – Buckie to Arbroath; and
- 2182B – North Sea Central Sheet.

17.3.1.5 Fishing Data

17 These data are presented from the AIS and non-AIS track data recorded during the shipping survey (August to October 2010). In addition, fishing vessel sightings were obtained from Marine Scotland and satellite vessel monitoring data were obtained from the Marine Management Organisation (MMO) and analysed to validate the survey data presented in the baseline assessment.

17.3.2 Survey Methodology

18 This section describes the survey methodology used when recording shipping survey data for the Neart na Gaoithe offshore wind farm.

17.3.2.1 Baseline Survey

19 Baseline shipping activity was assessed using AIS and radar track data. The period of data collection encompassed seasonal fluctuations in shipping activity (summer and autumn), and also accounted for a range of tidal conditions. When the survey vessel was approximately 10 NM from the offshore site (e.g., when travelling between port), AIS tracking range was limited at the site, therefore coastal based survey data and in-house AIS data were used to supplement partially recorded days.

20 Details on non-AIS vessels were gained by tracking targets on the ARPA onboard the survey vessel. This was supplemented by manual observation of vessels within visual range to obtain information on type and size, where the information was not available from AIS.

21 In addition, AIS shipping data collected from coastal AIS surveying by FTOWDG during November 2009 to May 2010 (seven months) and November 2010 to July 2011 (nine months) were analysed to validate the survey data collected from the geo-technical vessel. This coastal-based survey data were collected from sites with coverage of the outer Firth of Forth region located at Stonehaven, Dundee, Inner Forth and Dunbar.

17.3.3 Engagement and Commitments

22 The wind farm operator has a commitment to manage the risks associated with the activities undertaken at the wind farm in each phase of the project from construction, operation/maintenance to decommissioning. This includes the development of an Emergency Response Co-operation Plan (ERCoP) for the wind farm, which will be in place pre-construction.

23 As part of this commitment, the wind farm must meet the MCA's requirements in terms of standards and procedures for wind farm design and operation, including generator shutdown and other operational requirements in the event of a search and rescue (SAR), counter pollution or salvage incident in or around the site. These are laid out in Annex 5 of MGN 371 (MCA, 2008a.)

24 Stakeholder engagement and liaison throughout the life of the project will also need be carried out with fishing representatives, local harbour masters and information circulation via Notices to Mariners (NtMs) and navigation broadcasts.

17.3.3.1 Strategic and Site Level Requirements

25 Strategic and site level requirements as recorded during the scoping phase of the project are detailed in Table 17.1 and cross referenced to the area discussed within this chapter and the NRA technical report (Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment).

Source	Comment	Relevance/reference
Blue Seas Green Energy: A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters. Part A: The Plan (Marine Scotland, 2011)	Developments should avoid shipping routes where possible through appropriate positioning within the option boundary.	Baseline assessment identified current ship routeing in the area with the Impact Assessment (refer to Section 17.6) identifying any potential impact. The FTOWDG regional shipping study also identified routes that could be cumulatively impacted by the developments within the area.
	Where impacts cannot be avoided, these should be reduced through appropriate design. In the case of many of the sites and options, full NRAs are expected to be required, at a regional and/or site specific level.	A full Impact Assessment on shipping and navigation is presented in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment and carried out in Section 17.6: Impact Assessment.
	Cumulative effects require further work within the Plan review process and could be required at the project level.	Consultation with navigational stakeholders and FTOWDG regional work.
	Appropriate navigation mitigation required, including taking account of individual and cumulative effects in collaboration with the shipping industry.	Consultation with navigational stakeholders and FTOWDG regional work.
Scoping Opinion (Chamber of Shipping Advice)	Navigation is very important and relevant guidance should be followed.	The ES/NRA follows MGN 371 and DTI/DfT/MCA Guidance (Section 17.2: Guidance and Legislation).
	Traffic survey should incorporate AIS and radar data according to MGN 371.	Data were recorded over seasonal fluctuations with a vessel on site for 29 days. Longer term AIS data were also analysed.
	Require assessment of tidal regimes in and around the proposed zone; impacts on depth of traffic around site, implications of engine failure and tidal stream/weather given navigation and site, blocking or view blocking impacts, radar impacts, communications impacts, emergency response impacts and sound signal impacts.	The Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment and ES assess risk of drifting ship collision (tidal and/or weather and radar impacts see Section 17.6: Impact Assessment).
	Request information on type of traffic, prescribed routeing schemes or precautionary areas; proximity of the zone to areas used for anchorage, safe haven, port approaches and pilot boarding or landing areas; proximity of the zone to existing or proposed OREIs, offshore oil/gas platforms and marine aggregate dredging, marine archaeological sites or wrecks, or other exploration/exploitation sites; proximity of the zone to aids to navigation and/or Vessel Traffic Services (VTS) in or adjacent to the area and any impacts thereon; assessment of where the existing traffic could be displaced to and whether there is potential for choke points/conflicts to be created.	Noted and covered within the Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment and ES refer to Section 17.2: Guidance and Legislation.
Scoping Opinion (MCA Advice)	The NRA should be carried out according to MGN 371 (and MGN 372) and the DTI/DfT/MCA Guidance.	The NRA follows MGN 371 and DTI/DfT/MCA Guidance.
	Navigation should be assessed according to cable routes/burial depth - subject to traffic volumes an anchor penetration study may be necessary.	Baseline assessment identified current ship routeing in the area with the Impact Assessment (refer to Section 17.6) identifying potential impact.
	Reference should be made to the Marine Environmental High Risk Areas (MEHRAs) established at Bass Rock, Dunbar and The Isle of May and adjacent coastlines.	Noted in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment ES/NRA within Section 17.5: Baseline Description.
	Welcome the establishment of the Forth & Tay Development Group to collectively address navigation issues.	The FTOWDG regional shipping study and joint consultation was carried out.
	Request Navigation chapter extended in Appendix.	Technical reports on shipping and navigation will be provided as Appendices.
	Assessment of impacts on ship's radar is required through discussion with radar sub group of Nautical and Offshore Renewable Energy Liaison (NOREL).	The impact on ships radar is covered in the Impact Assessment Section 17.6.
	Guidance contained in MGN 371 should be followed.	Guidance contained in MGN 371 is followed through the NRA.
Scoping Opinion (Northern Lighthouse Board (NLB) Advice)	NLB is statutory consultee for navigation in the area, request on going consultation.	Ongoing consultation regarding turbine positions, alignment and lighting of the structure.
	Full NRA required, including detail of data gathering, surveying, installation and operations. Any vessels engaged in these works to comply with International Regulations for Preventing Collisions at Sea (IRPCS) 1972 Collision Regulations (COLREGS).	Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment covers the full survey methodology.
Scoping Opinion (Fife Council Advice)	The impact on Rosyth and European routes should be considered - strategic consideration for Scotland and Fife.	The Impact Assessment includes an assessment on possible re-routeing of ship routes (national and international).
Scoping Opinion (RYA Advice)	Information on the layout, spacing and direction of the set of turbines are required (crucial to avoid impeding navigation, particularly under sail).	Noted and will be supplied when wind farm design is finalised.
	Any temporary exclusion zones should conform to normal safety zone regulations and be lifted as soon as construction is completed.	Noted - use of safety zones will be confirmed for different phases when turbine layouts are finalised.
	Impact on navigational issues for both Commercial and Recreational vessels should be assessed (including collision, safety, risk management, emergencies, markings and lightings, impacts on navigation equipment, weather and drift/navigation, likely squeeze and visual and noise intrusion).	Refer to Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment and Section 17.6: Impacts Assessment for the impact assessment for recreational vessels also see Chapter 22: Other Users. Refer to Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment for indicative lighting.
	Suggest RYA position paper - guidance for minimising adverse effects of wind turbines and wind farms on navigation.	Guidance paper has been received and relevant points noted.

Source	Comment	Relevance/reference
Scoping Opinion (Marine Scotland)	NRA required, following (DTI/DfT/MCA Guidance (DTI/DfT/MCA, 2005).	The ES/NRA follows MGN 371 and DTI/DfT/MCA Guidance (Section 17.2: Guidance and Legislation).
	Radar and AIS survey, required, covering 28 days in 12 months before application. Consultation with NLB, MCA and ports required.	Data were recorded over seasonal fluctuations with a vessel on site for 29 days. Longer term AIS data were also analysed.
	Any formal recommendations for lighting and marking to be given through the Coast Protection Act 1949 – Section 34 process.	Section 34 of the Coast Protection Act 1949 has been repealed by the Marine (Scotland) Act 2010 and replaced with the Marine Licensing regime. IALA Guidance (O-139) will be followed along with consultation with NLB.
	NLB is statutory consultee for navigation in the area and request on going consultation.	Refer to Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment and ES Section 17.3.3.2 Consultation.
Advice to Forth and Tay Offshore Wind Developer Group (Chamber of Shipping)	Study should include analysis of costs incurred by vessels as a result of any re-routeing. Analysis should also take account of the costs (financial and time) associated with any re-routeing.	The FTOWDG regional shipping study and joint consultation was carried out to identify the potential impact on vessels re-routeing through the region.
Advice to Forth and Tay Offshore Wind Developer Group (MCA)	Tourism and Recreational activities should be included as a cumulative impact to ensure requirements of MGN 371 are met.	Recreational activity is presented in the Baseline assessment and also addressed within the Impact Assessment.
Advice to Forth and Tay Offshore Wind Developer Group (Forth Ports)	Outcomes from Donaldson report should be considered in context of developments potential forcing vessels with hazardous cargos near the shore.	The location of nearby MEHRAs are identified and considered when/if shipping requires to be re-routed due the wind farm development.
	Support preliminary hazard assessment, guidance available on Forth ports website on Port Marine Safety code and risk assessments.	Available information applicable to the wind farm development will be considered within the ES/NRA.
Advice to Forth and Tay Offshore Wind Developer Group (Fife Council)	Full consideration of potential impacts on Fife ports should be considered (e.g., on Port of Rosyth and possible development of future European routes and expansion strategy). Cumulative assessment should take into account shipping information from the National Renewable Infrastructure Plan (N-RIP) and potential for employment in Fife ports.	The FTOWDG regional shipping study and joint consultation was carried out to identify the potential impact on vessels re-routeing through the region. Cumulative issues are also assessed within Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment and Section 17.8: Cumulative and In-Combination Impacts.

Table 17.1: Strategic and site level commitments and requirements

17.3.3.2 Consultation

26 FTOWDG was formed to provide a collaborative approach to consultation, surveying and assessing potential cumulative and in-combination impacts. The FTOWDG comprises:

- Mainstream Renewable Power - Neart na Gaoithe Offshore Wind Farm;
- Seagreen - Firth of Forth Round 3 Zone 2 development; and
- Repsol Nuevas Energías UK - Inch Cape Offshore Wind Farm.

27 FTOWDG also commissioned a regional assessment on the potential impacts to shipping and navigation, issued to the developers in November 2011 (updated in February 2012); this report is attached as Appendix 17.6: FTOWDG Regional Shipping Review.

28 Key marine and navigational stakeholders were consulted through the FTOWDG regional work and incorporated into the NRA; full details of the stakeholders consulted and minutes are provided in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment. The following stakeholders were consulted during this process:

- MCA/DfT;
- RNLI;
- NLB;
- The Chamber of Shipping;
- Forth Ports Ltd;
- RYA/CA; and
- Vessel Operators.

29 The main comments recorded during the FTOWDG consultation, relevant to the Neart na Gaoithe offshore wind farm development, are summarised below:

- MCA/DfT stated their support for the regional approach to assessing the possible cumulative impacts of the outer Firth of Forth and Tay developments. Additional comments related to the assessment methodology and need for shipping operator engagement. It is noted that information on the FTOWDG regional developments was issued to shipping operators to gain feedback of the developments between April and June 2011. The shipping operator responses are summarised within the FTOWDG regional cumulative shipping and navigation report (Appendix 17.6: FTOWDG Regional Shipping Review).
- The Chamber of Shipping noted that coastal shipping uses routes west of Inch Cape and Neart na Gaoithe from northern Scottish ports to the Forth (east/west of Bell Rock). It was also stated that this route was used due to the high volume of traffic entering the Firth of Forth, south of the Isle of May. Safety concerns were raised over the proposed alternative routeing around Inch Cape and Neart na Gaoithe due to the increasing volume of vessel traffic along the existing coastal route. Vessels will pass inshore of the developments in narrower shipping routes increasing the risk of close ship-to-ship encounters, i.e., under 1 NM.
- General concerns were expressed regarding smaller vessels being pushed further offshore and the impact on them being further east and hence out in heavier weather. Potential future developments in the Forth area include three to four biomass plants, which if constructed could bring in an increased number of large bulk carriers (this was identified as a potential in-combination issue).

17.3.3.3 Shipping and Navigation Hazard Workshop

30 A hazard identification workshop was carried out as part of the NRA, details can be found in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment. During the workshop the key maritime hazards associated with the wind farm development were identified with local stakeholders and associated scenarios prioritised by risk level.

31 A summary of the main findings from the shipping and navigation workshop are provided below:

- SAR/Emergency Response: tugs are on 24 hour stand-by at the Hound Point and Braefoot Bay marine terminals. Tugs in the Firth of Forth can travel at approximately 13 knots with the possibility of responding to a drifting or ship collision incident at Neart na Gaoithe within approximately two hours;
- Commercial Vessels: drifting and machinery failures east of the Forth Ports limit were highlighted during the workshop as they can be a frequent event. As noted, tugs are stationed at the marine terminals in the Firth of Forth. In a southwest wind, a drifting vessel could be blown towards Neart na Gaoithe;
- Recreational Vessels: a number of incidents in the area (for example, machinery failures and vessels caught in adverse weather conditions) involved vessels from Scandinavia that had sailed off course. Liaison should be carried out with local harbour masters on developments to share information amongst smaller ports and non-commercial vessels;
- Fishing Issues: an operational plan is recommended, including liaison with fishing vessels, to ensure project related vessels do not interfere with fishing gear (including nets and static gear). In terms of the expected export cable route, the cable should be buried to target depth due to the nature of the seabed. The inter-array cables within Neart na Gaoithe should also be buried based on seabed conditions. Around turbines and substation(s) there are J-tubes where the cables come out of the substrate. J-tubes could be protected by rock dumping or mattresses when protecting against scour. Fishermen noted a preference for rock dumping as mattresses can pose greater risk to gear. There will be 500 m safety zones proposed around the major installation/construction vessels, excluding fishing vessels from the area and reducing the risk of vessels interacting with exposed J-tubes. If a problem is identified with cable burial during surveying (for example cable movement) this should be reported to the fishing industry;
- Vessel Monitoring: combined vessel monitoring in the area could be explored, with the possibility of other developers collaborating with Forth Ports who have VTS coverage of the area; and
- Cumulative Issues: smaller commercial vessels and coastal tankers may have to re-route east of the Firth of Forth Round 3 Zone 2, Inch Cape and Neart na Gaoithe developments. Vessels of this type are likely to be operating to tight time and fuel margins and need to take the shortest routes (i.e., west of the wind farm developments).

17.4 Impact Assessment Methodology

32 The impact on the main vessel types in the study area was assessed quantitatively in the NRA and EIA based on the findings of this baseline assessment.

33 An FSA has been carried out within the NRA (Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment) in line with the IMO FSA process (IMO, 2002) and DTI/DfT/MCA template (DTI/DfT/MCA, 2005) as illustrated in Figure 17.1.

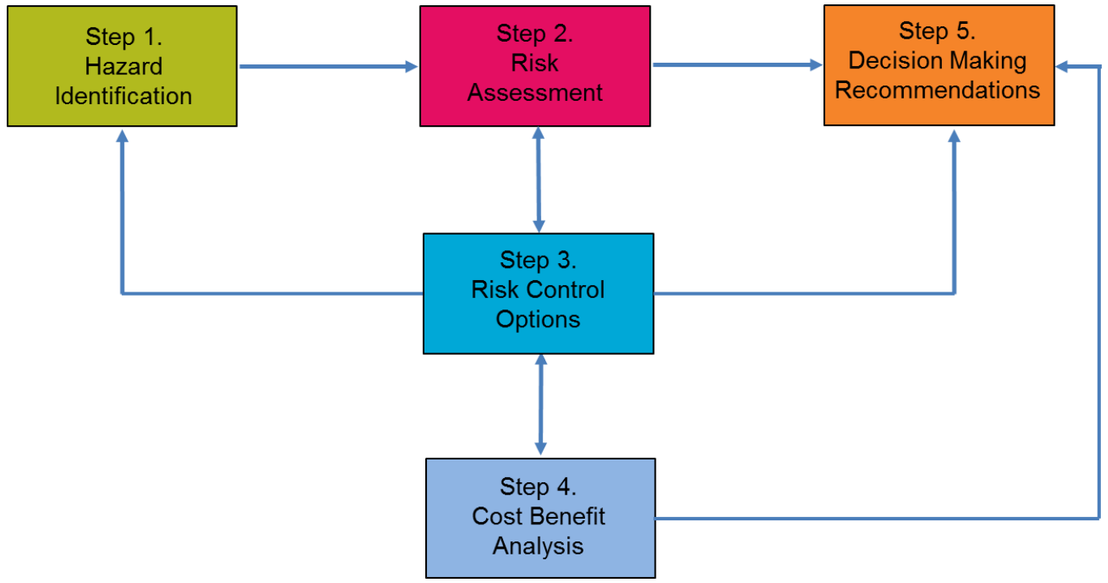

Figure 17.1: Overview of formal safety assessment

17.4.1 The Rochdale Envelope

34 For the shipping and navigation impact assessment, 3.6 MW and 6 MW indicative layouts have been used with Layout A consisting of the maximum number of turbines and Layout B having the largest machines. Given the uncertainty over the final machines, two indicative layouts have been used, which include additional turbines dependent on power rating. Chapter 4: Site Selection, Project Alternatives and Design Evolution describes how the two layouts were developed and the details of the indicative Layouts A and B are provided below:

- Layout A includes 128 turbines (of which a maximum of 125 will be constructed) and is to be used for both the 3.6 and 4 MW turbine options. In Layout A, if 3.6 MW turbines are used there are three additional turbines, which allow for flexibility in final positions. There are also an additional 19 turbines if 4.1 MW machines are used in Layout A, to fulfil the lease capacity; and
- Layout B includes 80 turbines (of which a maximum of 75 will be constructed) and is to be used for both the 6 and 7 MW turbines. Using 80 turbine positions means an additional five 6 MW turbines and an additional 15 x 7 MW turbines to those required to fulfil the lease capacity.

35 Four indicative offshore substations and the proposed met mast location have been modelled; however no more than two substations will be installed in the final layout (see Chapter 5: Project Description).

36 It is noted that the site is constrained to a 450 MW maximum output, therefore, only the number of turbines required to provide up to 450 MW capacity will be installed in the final layout.

37 It is considered that by using the Rochdale Envelope maximum number of turbines and offshore substations in Layouts A and B, the worst realistic case assessment of the possible impact to shipping and navigation has been carried out.

17.4.2 Study Area

38 The area of operation of the survey vessel during the shipping traffic survey within a 10 NM range is presented in Figure 17.2. The 10 NM buffer provides an indication of meaningful data coverage relative to Neart na Gaoithe.

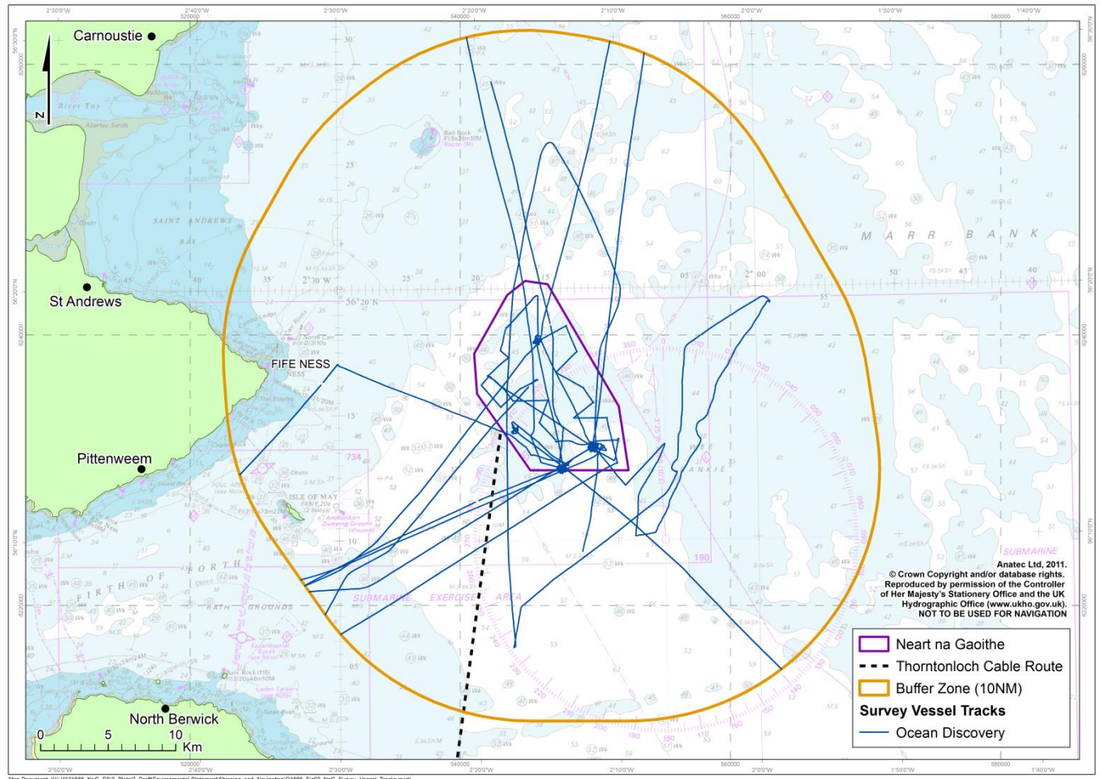

Figure 17.2: Survey vessel tracks within 10 NM of Neart na Gaoithe

39 The tracks of the survey vessel are excluded from the shipping analysis to improve the understanding of passing and other types of shipping.

17.4.3 The Approach to Impact Assessment

40 To assess the potential impact that developing the Neart na Gaoithe wind farm may have on shipping and navigation, the results are presented in risk estimates, in quantitative terms for the modelled scenarios within Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment. Following the hazard workshop ranking and identification of higher risk scenarios, the impacts on the shipping and navigation receptors for different phases of the project are assessed.

41 The potential impacts on shipping and navigation from offshore wind farm developments are not easily categorised using environmentally based significance criteria outlined within Chapter 6: The Approach to Environmental Impact Assessment. For Neart na Gaoithe, the following definitions of magnitude (Table 17.2) and sensitivity Table 17.3) (the term sensitivity is used in this chapter in place of vulnerability to reflect commonly used terminology) of shipping and navigation receptors have been used to predict impacts and overall significance.

42 It is noted that the impact assessment has assumed industry standard mitigation measures will be in place during the construction, operation and decommissioning phases of the project. A list of mitigation measures, including industry standard and best practice, is presented in Section 17.7, and Table 17.5.

17.4.3.1 Magnitude of Effect

43 The potential magnitude of effect on shipping and navigation based on the physical change in the environment from baseline conditions as a result of the offshore site is defined in Table 17.2.

Magnitude	Definition
High	Total loss or very major alteration to internationally important shipping lanes, i.e., IMO Routeing measures.
Moderate	Major alteration or loss of strategically important shipping lanes and navigational port approaches, i.e., shipping routes used by vessels headed in/out Firth of Forth and River Tay.
Minor	Minor shift from baseline conditions leading to a partial loss or alteration to lower use navigable routes from baseline conditions, i.e., shipping routes and channels used by small and medium sized vessels using coastal routes.
Negligible	Very slight change from baseline shipping and navigation routeing.

Table 17.2: Definition of the impact on shipping and navigation

17.4.3.2 Vulnerability

44 The potential scale of importance relating to shipping and navigation vulnerability is defined in Table 17.3.

Value/vulnerability	Definition
High	Feature of international importance, e.g., IMO routeing measure such as a Traffic Separation Scheme (TSS) and Deep Water Routes (DWR) used by vessels with a large draught.
Moderate	Feature of national importance, e.g., busy shipping lanes and port approach routes/channels, such as Firth of Forth and River Tay, used by a range of ships, including medium/large size vessels.
Minor	Feature of local or regional importance, i.e., notable navigable channels used by small to medium sized vessels, such as coastal routes east/west of Bell Rock and off the Fife coast.
Negligible	Negligible impact in terms of shipping and navigation.

Table 17.3: Definition of terms relating to the vulnerability of shipping and navigation

17.4.3.3 Overall Significance

45 Based on the potential magnitude of effect on shipping and navigation and the importance of the route (i.e., the vulnerability), the potential impacts on shipping and navigation have been predicted by applying the following significance terminology as described below:

- **Not significant**. Impacts that are slight and negligible in terms of vessel navigation, collision risk and response to marine incidents.
- **Minor significance**. Impacts which are of generally small magnitude in terms of vessel navigation (e.g., Minor deviation of small to medium sized vessels on local or regionally important routes), collision risk and response to marine incidents.
- **Moderate significance**. Impacts which are considered to be moderate in magnitude in terms of vessel navigation (e.g., Moderate deviation on nationally important routes), collision risk and response to marine incidents.
- **Major significance**. Impacts which are of greater magnitude, in terms of vessel navigation (e.g., Large deviations on internationally important routes or loss of IMO routeing measures), collision risk and response to marine incidents.

46 The area defined for risk modelling is within 10 NM of the Neart na Gaoithe area and this is presented in Figure 17.2. The 10 NM range from the wind farm gives a comprehensive study area encompassing the main vessel types passing through the outer Firth of Forth and Firth of Tay areas.

17.4.4 Cumulative and In-combination Impact Assessment Approach

47 The cumulative and in-combination impacts (refer to Chapter 6: The Approach to Environmental Impact Assessment) arising from Neart na Gaoithe and the other wind farm developments within the Firth of Forth and Tay area (i.e., those at Inch Cape and within the Firth of Forth Round 3 Zone 2) are assessed in Section 17.8 of this ES.

48 The methodology used to assess the cumulative and in-combination impact from Neart na Gaoithe follows the impact assessment methodology presented in Section 17.4. Individual indicative project boundaries for the regional developments have been used for the cumulative and in-combination assessment. These boundaries are current as of February 2012 and include 450 MW capacity for Neart na Gaoithe, approximately 1,000 MW for Inch Cape and a circa 3.5 GW capacity layout for the Firth of Forth Round 3 Zone 2.

49 The assessment also assumes industry standard mitigation measures within MGN 371 and lighting/marking as per IALA O-139 and any specific marking requirements from the NLB.

50 Cumulative issues are also being assessed as part of the FTOWDG remit (refer to Chapter 6: The Approach to Environmental Impact Assessment). The regional shipping and navigation assessment can be found in Appendix 17.2: Hazard Log Review Report.

17.5 Baseline Description

17.5.1 Offshore Site

51 The baseline presents a description of the existing navigational features and shipping activity recorded within and adjacent to Neart na Gaoithe offshore wind farm. The baseline data for each of the main navigational users are presented in the following sections.

17.5.1.1 Navigational Features

52 This section describes the navigational features in the vicinity of Neart na Gaoithe; these are shown in Figure 17.3.

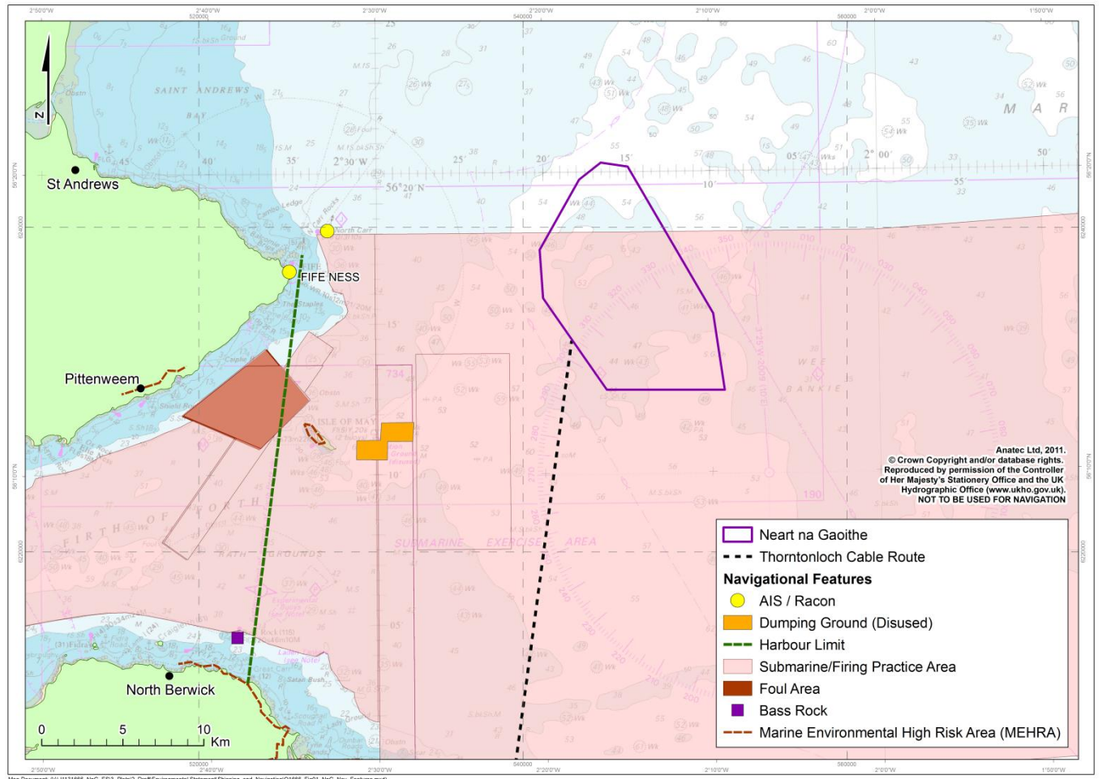

Figure 17.3: Navigational features in proximity to Neart na Gaoithe

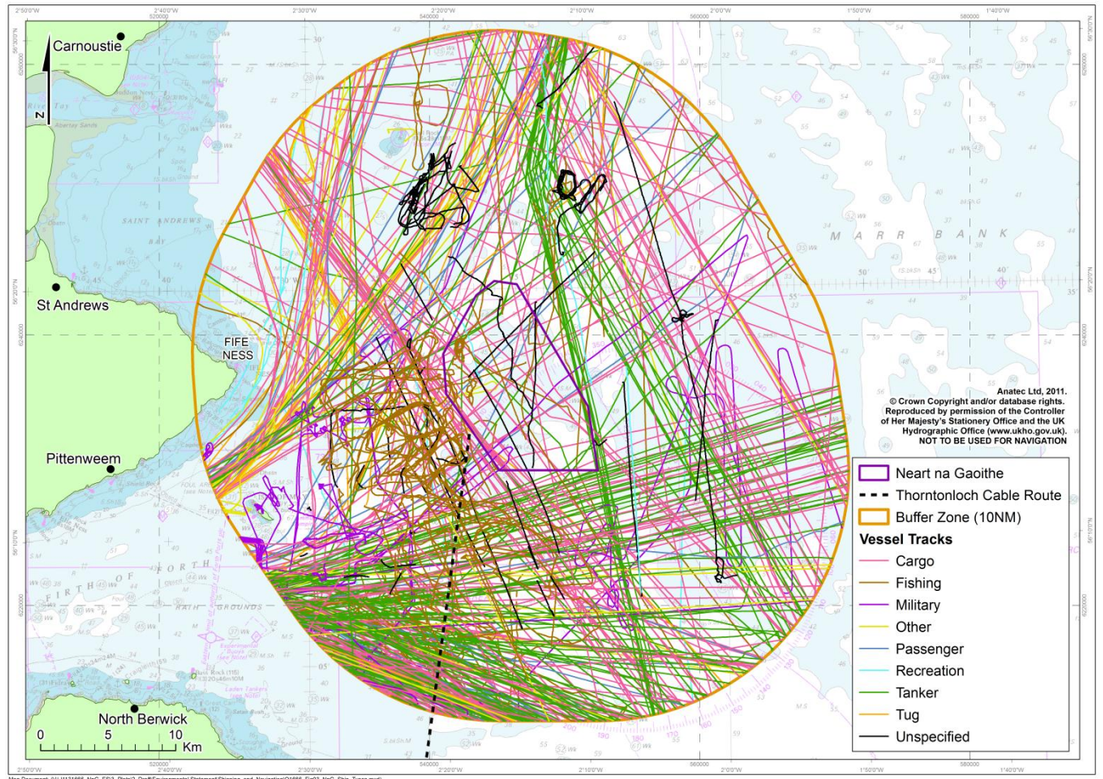

Figure 17.4: AIS and radar tracks by ship type (August to October 2010: 29 days)

53 A general practice and submarine exercise area overlies approximately 25 NM^2 (82%) of the wind farm (total area 30.5 NM^2). Within 10 NM of the offshore site there are seven military Practice and Exercise Areas (PEXAs) including overlapping general practice and firing, submarine and exercise areas (refer to Chapter 18: Military and Aviation for more information). No restrictions are placed on the right to transit firing practice areas at any time and exercises/firing only take place when the areas are considered to be clear of all shipping.

54 Neart na Gaoithe offshore wind farm is located approximately 8.4 NM east of the eastern limit of the authority of Forth Ports and 6.8 NM south-southeast of Bell Rock. It is noted that the IMO recommends laden tankers should avoid the area between the Bass Rock and the coast (due to water depth restrictions), approximately 15 NM southwest of the wind farm off Dunbar and North Berwick.

55 Areas around Bass Rock and the Isle of May are also MEHRAs identified in 2002 (see Figure 17.16). These areas have been identified by the UK Government as areas of environmental sensitivity and at high risk of pollution from ships. The Government expects mariners to take note of MEHRAs and either keep well clear or, where this is not practicable, exercise an even higher degree of care than usual when passing nearby.

17.5.1.2 Shipping Analysis

56 A combined AIS and radar dataset was created including 29 days of AIS and radar data collected from the survey vessel (21 days of radar tracks in total) during the period August to October 2010. Any duplicate tracks (i.e., recorded on AIS and Radar) were filtered from the final survey data.

57 A plot of the ship tracks recorded during the survey period colour-coded by vessel type is presented in Figure 17.4.

58 In total there was an average of between 16 and 17 vessels per day passing within 10 NM of Neart na Gaoithe with the large majority of tracks associated with those ports on the Rivers Forth and Tay. In terms of ships intersecting the proposed wind farm area, there was an average of two vessels per day.

59 The longer term historical data showed good agreement with the shipping survey data collected by the geo-technical vessel. Figure 17.5 presents the number of ships recorded passing within 10 NM and intersecting Neart na Gaoithe from November 2009 to May 2010.

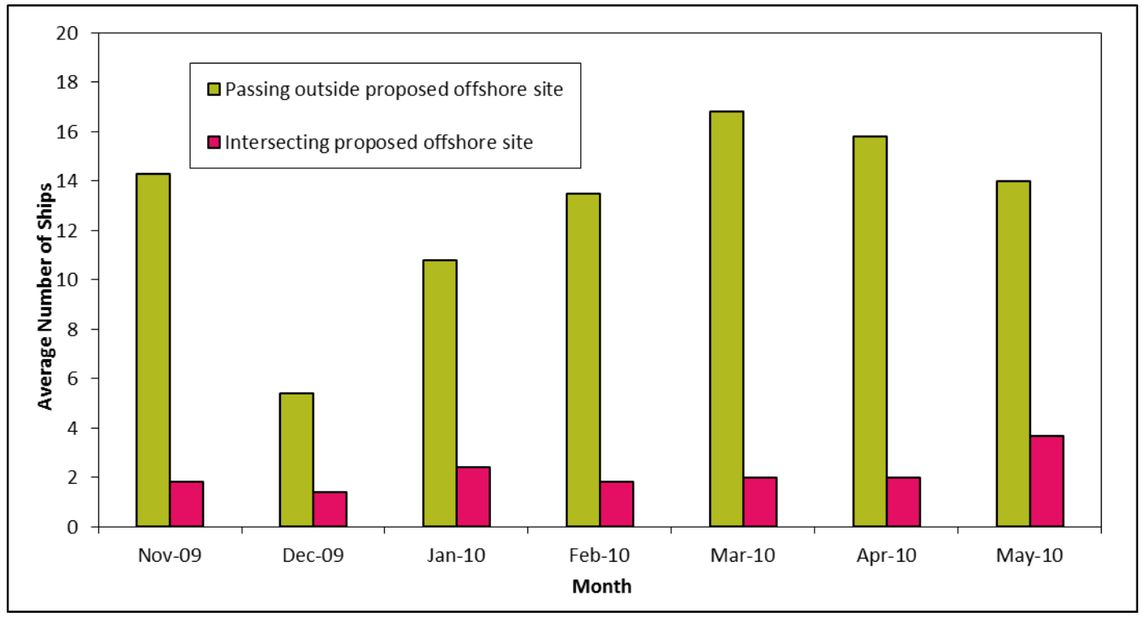

Figure 17.5: Average number of ships per day passing and intersecting Neart na Gaoithe (November 2009 to May 2010)

60 There was an average of just over two vessels per day passing through the wind farm area over the seven months of data collected, with approximately 13 daily vessels passing outside Neart na Gaoithe offshore wind farm (within 10 NM). In general, the shipping datasets analysed encompassed seasonal and tidal variations, with both surveys recording comparable shipping volumes passing within 10 NM and through the Neart na Gaoithe site.

61 A plot of the most recent month of coastal AIS survey data, recorded during July 2011, is presented in Figure 17.6. This chart presents AIS tracks recorded during July 2011 to visually validate shipping activity compared with earlier data. The visual records indicate that routeing has not changed significantly compared to 2009/2010 data and survey data recorded from the geo-technical vessel in 2010.

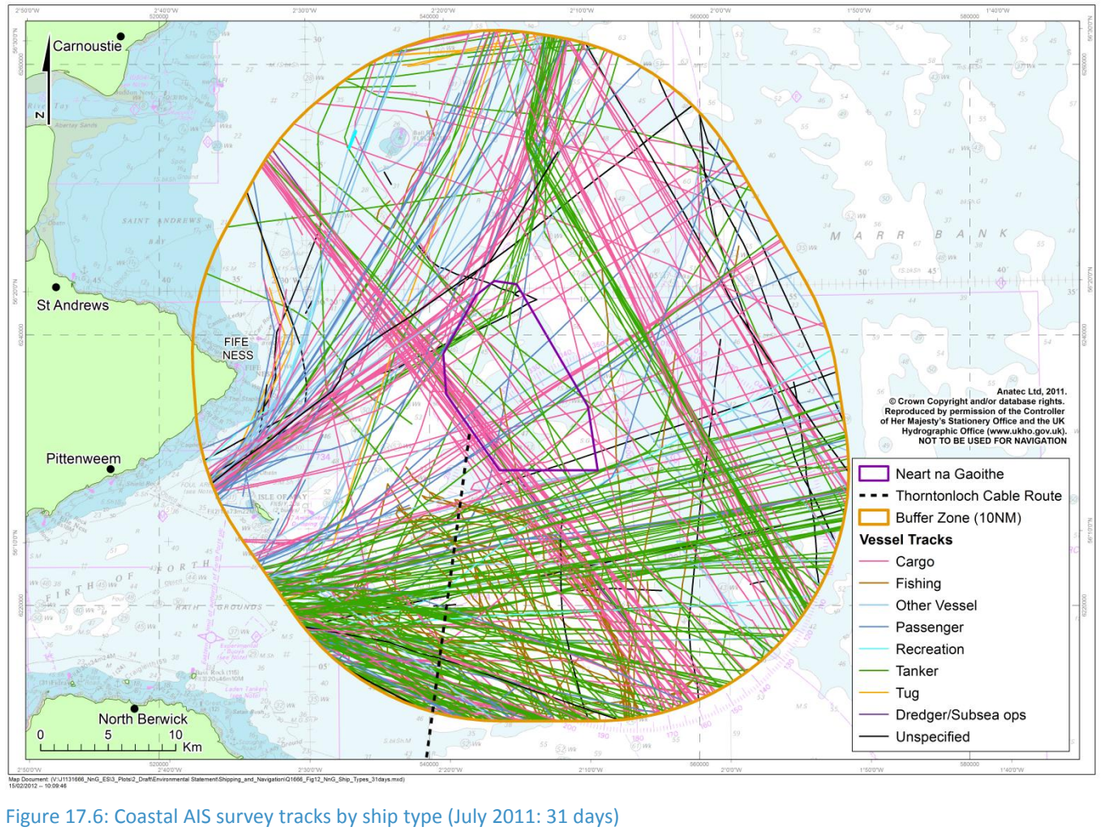

Figure 17.6: Coastal AIS survey tracks by ship type (July 2011: 31 days)

62 The AIS data analysed indicate the large majority of shipping is travelling into or out of the Firth of Forth, to the south of the wind farm. There are fewer vessels on coastal routes off Fife Ness and Bell Rock, and traffic headed into or out of the Firth of Tay.

63 The coastal survey data recorded from November 2010 to July 2011 showed good agreement with the coastal survey from 2009/2010 and ship based survey data collected in 2010. Figure 17.7 presents the number of ships recorded passing within 10 NM and intersecting Neart na Gaoithe offshore wind farm from November 2010 to July 2011.

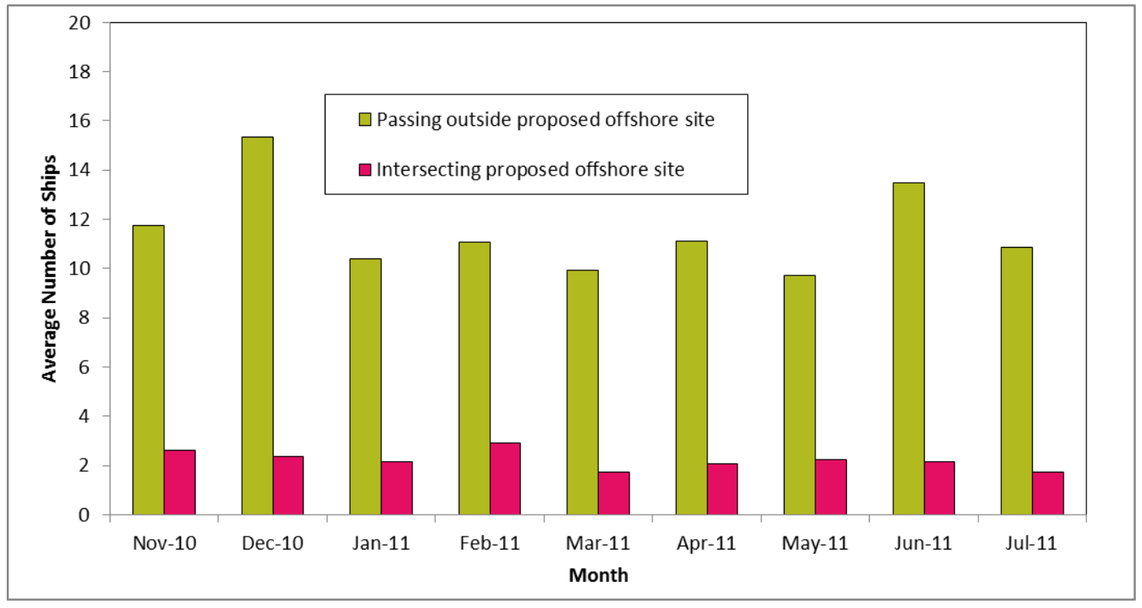

Figure 17.7: Average number of ships per day passing and intersecting Neart na Gaoithe (November 2010 to July 2011)

64 There was an average of just over two vessels per day passing through the wind farm area over the nine months of data collected, with approximately 11 to 12 daily vessels passing outside Neart na Gaoithe offshore wind farm (within 10 NM).

65 In general, the comparison of 2009/10 and 2010/11 shipping data showed that shipping movements and routeing in the area within 10 NM of Neart na Gaoithe did not significantly change.

17.5.1.3 Fishing Vessel Activity

66 Fishing vessel activity was recorded during the shipping survey (August to October 2010). Figure 17.8 presents the fishing vessel tracks recorded on AIS (52%) and radar (48%).

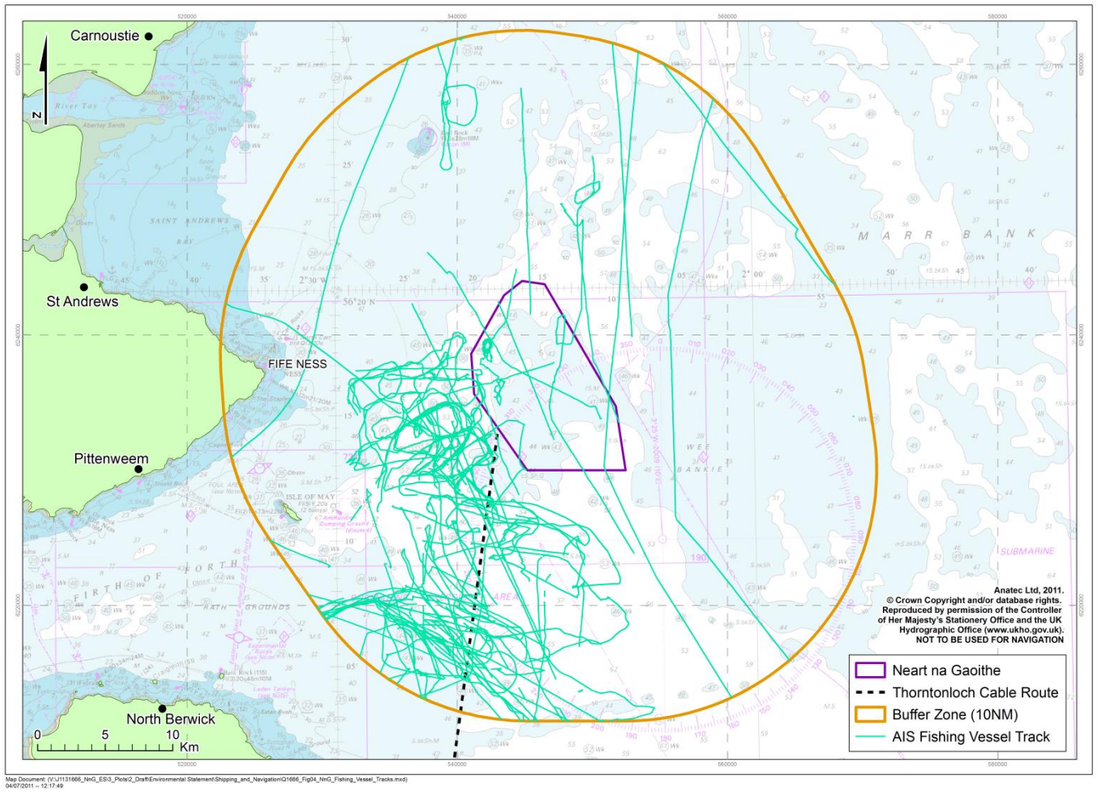

Figure 17.8: AIS and radar fishing vessel tracks (August to October 2010: 29 days)

67 Fishing activity was generally highest south and west of Neart na Gaoithe and this agrees with fishing satellite surveillance data (2009) as presented in Figure 17.9.

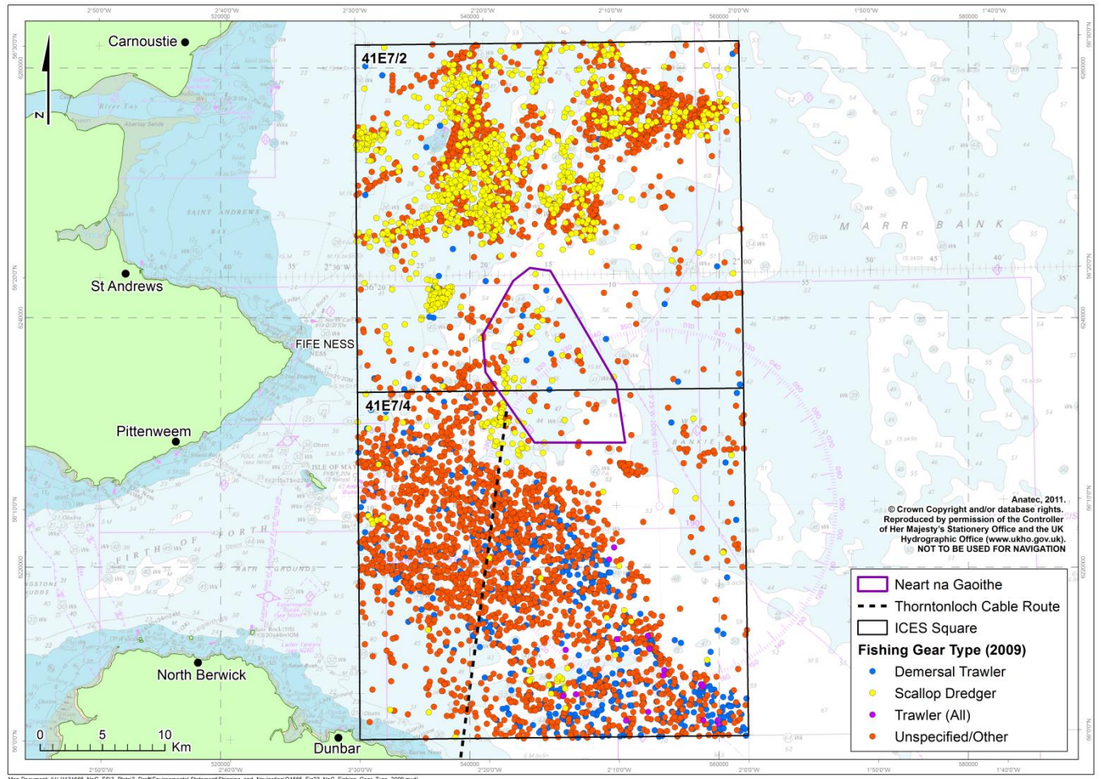

Figure 17.9: Chart of UK and non-UK fishing vessel positions by type (2009)

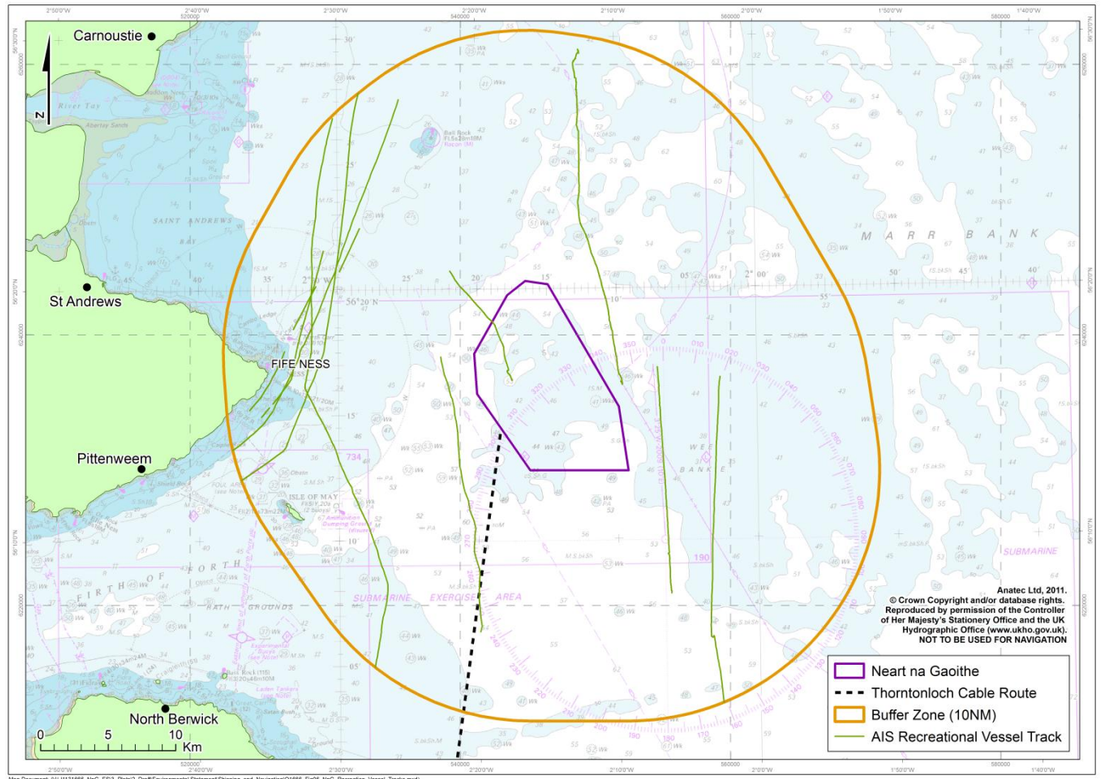

Figure 17.10: AIS and radar recreation vessel tracks (August to October 2010: 29 days)

17.5.1.4 Recreational Vessel Activity

68 This section reviews the baseline recreational vessel activity at Neart na Gaoithe offshore wind farm based on information from the RYA and the CA, and AIS/radar survey data (August to October 2010).

Recreation Survey Data

69 Figure 17.10 presents the recreational vessel tracks recorded during the shipping survey.

70 Recreational vessels were recorded using cruising routes (presented in Figure 17.11) off Fife Ness between north eastern marinas (Arbroath and Stonehaven) and the Firth of Forth. A number of yachts were also tracked passing offshore (east) of the Isle of May, likely to be sailing from northeast Scotland to Eyemouth and northeast England.

Royal Yachting Association Data

71 A plot of the recreational activity based on the latest RYA data (2010) is presented in Figure 17.11.

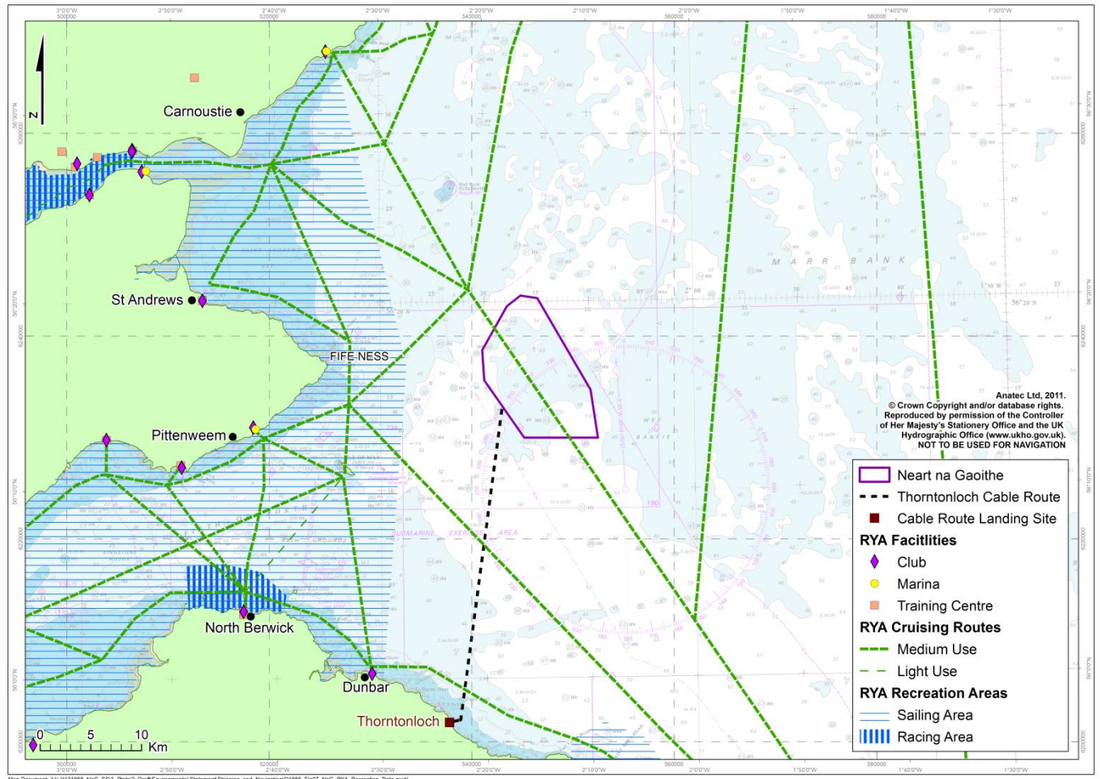

Figure 17.11: Recreation data for Neart na Gaoithe (RYA, 2010)

72 Based on the RYA data, the wind farm is approximately 4 NM west of the general racing and sailing areas off the Fife coast.

73 There is one medium use cruising route intersecting the wind farm, passing from the Tay, Arbroath and Scottish marinas to north eastern English marinas including Amble and South Shields. Medium use cruising routes are defined as 'popular routes on which some recreational craft will be seen at most times during summer daylight hours.'

17.5.1.5 Maritime Incidents

74 This section reviews maritime incidents that have occurred in the vicinity of Neart na Gaoithe offshore wind farm in recent years based on MAIB and RNLI incident data.

Marine Accident Investigation Branch (MAIB) Data

75 The locations (MAIB aim for 97% accuracy in reporting the locations of incidents) of accidents, injuries and hazardous incidents reported to MAIB within 10 NM of the Neart na Gaoithe site for the last ten years (January 2001 to December 2010) are presented in Figure 17.12, colour-coded by type.

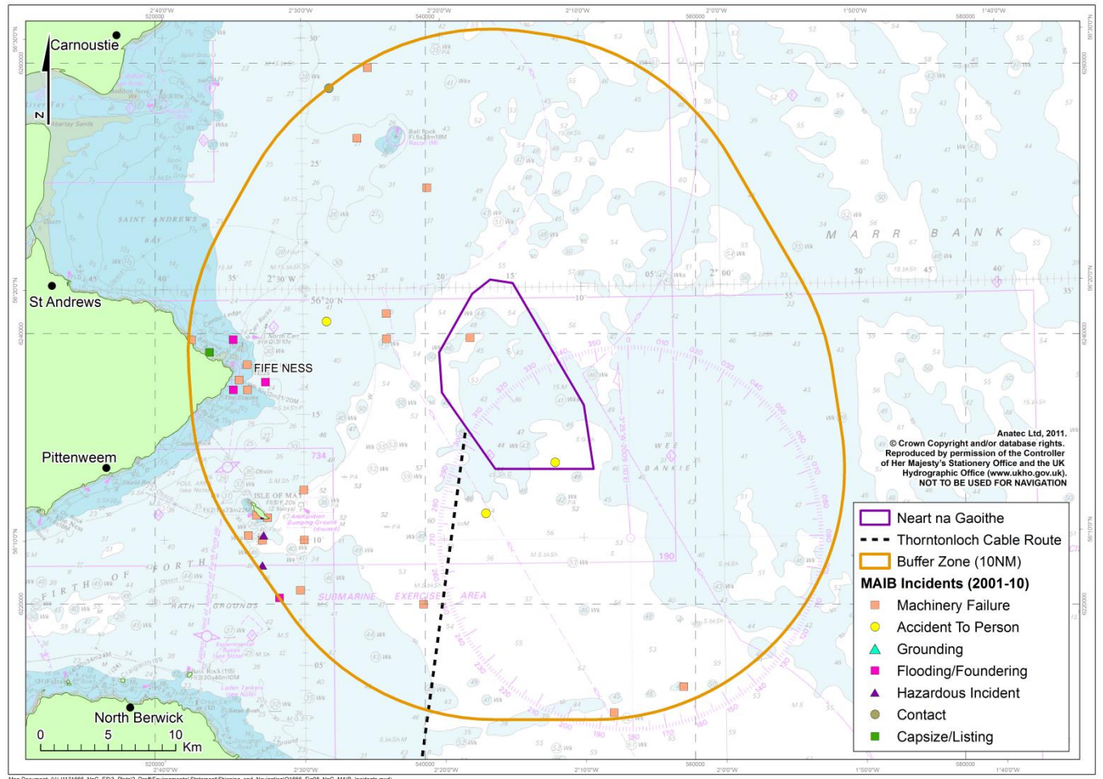

Figure 17.12: MAIB data by type within 10 NM of Neart na Gaoithe

76 A total of three unique incidents involving 36 vessels were reported within 10 NM, corresponding to an average of three per year.

77 Two incidents were reported within the wind farm area; one involving an accident to person and the second machinery failure. The former occurred to the south of the wind farm area onboard a research/survey vessel in moderate sea conditions during September 2010. It is noted that this vessel was associated with the Neart na Gaoithe offshore site surveying, and would not have been there except for the wind farm proposal.

78 The second incident inside Neart na Gaoithe involved a UK-registered fishing vessel of 6.6 m length that had a machinery failure in September 2001, no other details were supplied and the vessel was undamaged.

Royal National Lifeboat Institution Data

79 Data on RNLI lifeboat responses within 10 NM of the Neart na Gaoithe offshore wind farm in the ten-year period between 2001 and 2010 have been analysed. A total of 107 launches to 80 separate incidents were recorded by the RNLI (excluding hoaxes and false alarms). Figure 17.13 presents the geographical location of incidents colour-coded by casualty type.

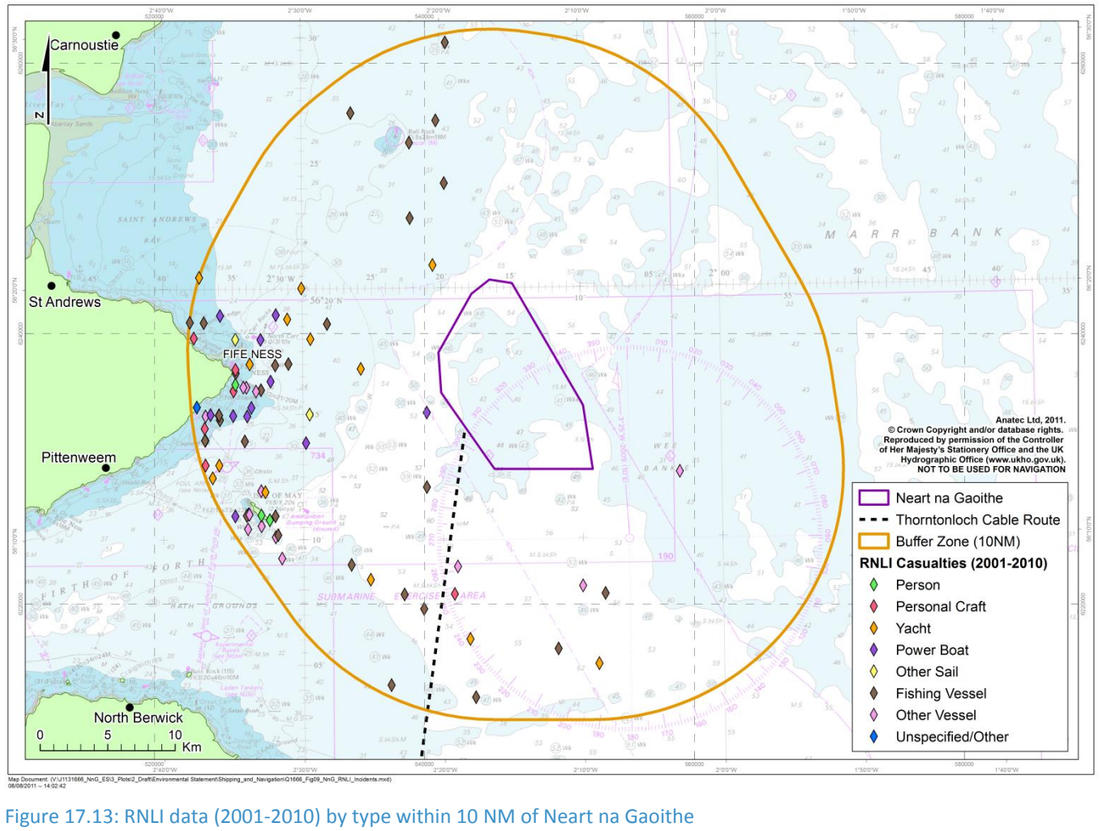

Figure 17.13: RNLI data (2001-2010) by type within 10 NM of Neart na Gaoithe

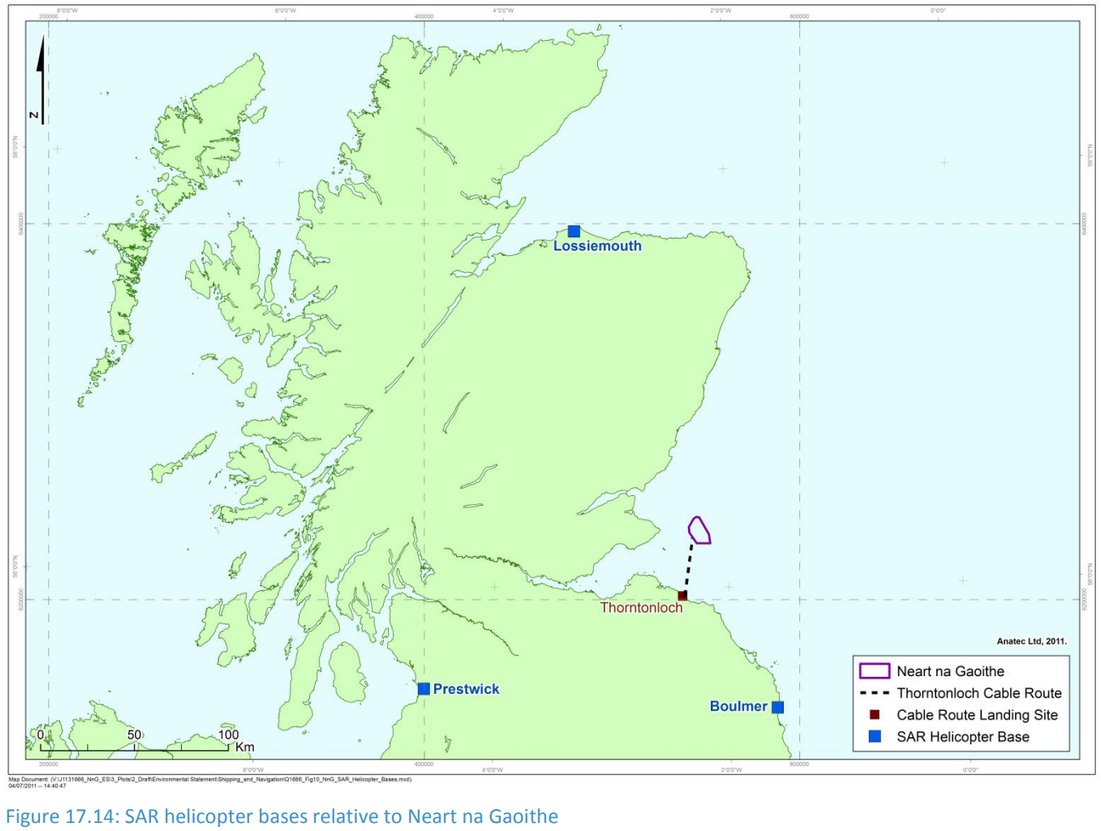

Figure 17.14: SAR helicopter bases relative to Neart na Gaoithe

80 There was an average of eight RNLI incidents per year recorded within 10 NM of Neart na Gaoithe from 2001-2010, with the large majority of incidents recorded off Fife Ness and Isle of May.

81 There were no incidents recorded within the wind farm area over the 10 years analysed. The closest incident was recorded approximately 1 NM west of the offshore site and involved a large power boat in April 2004 in wind force five. A leak/swamping occurred on the power boat and Dunbar All Weather Lifeboat (ALB) assisted the vessel.

17.5.1.6 Search and Rescue

82 This section summarises the existing Search and Rescue resources in the region. Additional information on the radar capabilities of SAR facilities is detailed in Chapter 18: Military and Aviation.

SAR Helicopters

83 A review of the assets in the area of the wind farm indicated that the closest SAR helicopter base is located at Boulmer (Figure 17.14), operated by the RAF, approximately 51 NM to the south-southeast of Neart na Gaoithe. This base has Sea King helicopters with a maximum endurance of 6 hours and speed of 110 mph giving a radius of action of approximately 250 NM which means the Neart na Gaoithe site is well within its range. During preparation of the ES it was noted that RAF Boulmer SAR operations will cease in 2015 as part of the UK Government SAR rescue restructure.

RNLI Lifeboats

84 The RNLI maintains a fleet of over 400 lifeboats of various types at 235 stations round the coast of the UK and Ireland. The RNLI stations in the vicinity of Neart na Gaoithe are presented in Figure 17.15.

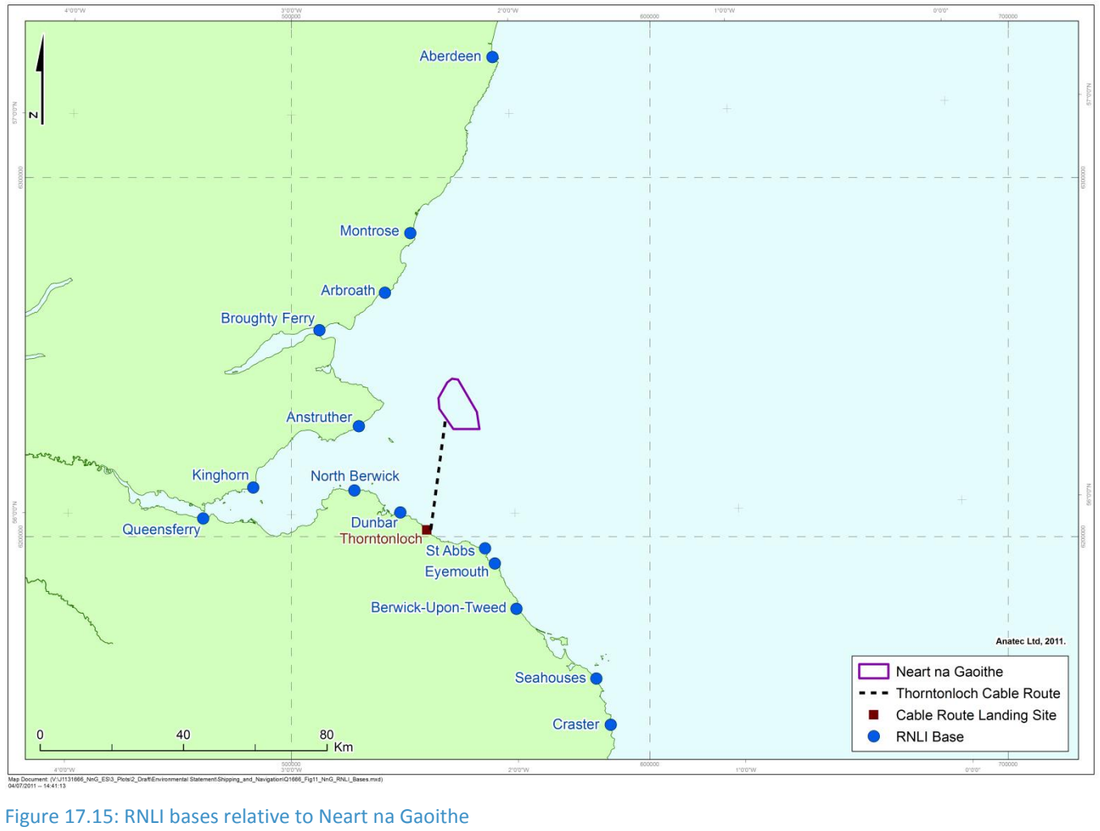

Figure 17.15: RNLI bases relative to Neart na Gaoithe

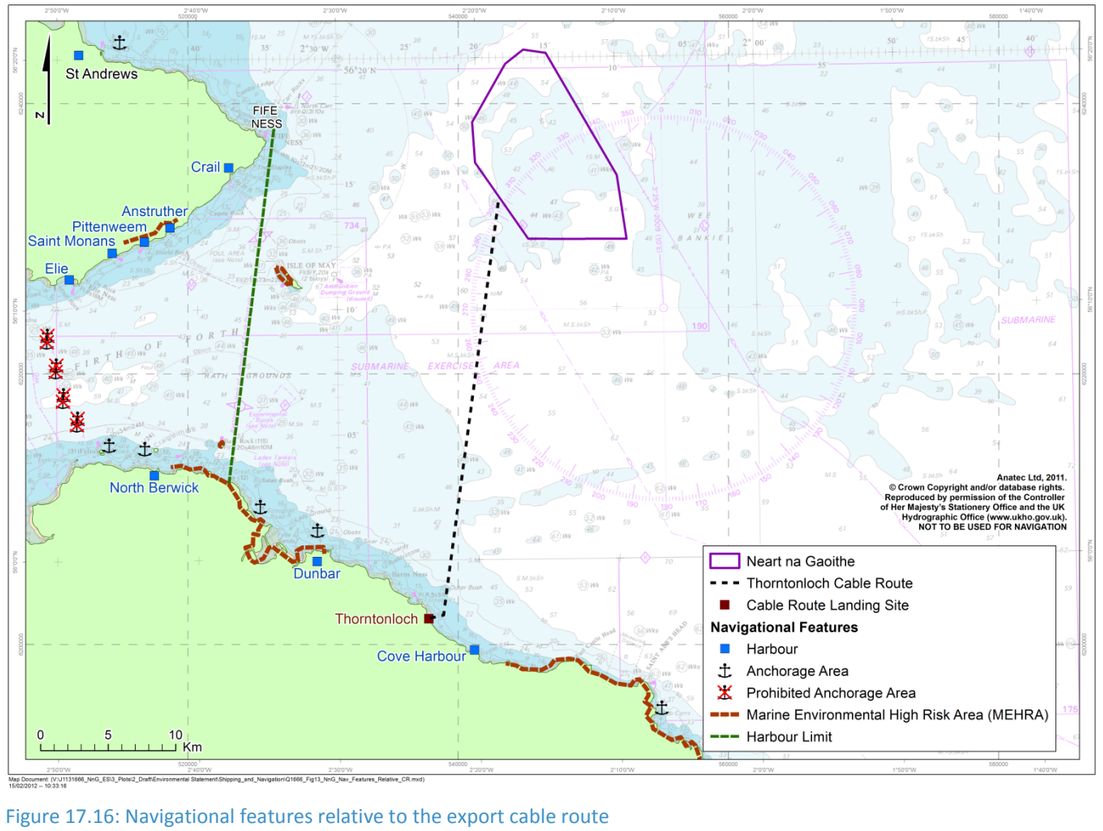

Figure 17.16: Navigational features relative to the export cable route

85 At each of these stations, crew and lifeboats are available on a 24-hour basis throughout the year. Based on the offshore position of Neart na Gaoithe offshore wind farm it is likely that ALBs would respond to an incident at the wind farm from Anstruther, Dunbar or Arbroath. This is confirmed when reviewing the historical incident data.

17.5.2 Cable Route

86 Shipping survey data, fishing data, recreation activity and maritime incidents have been presented relative to the proposed Neart na Gaoithe offshore wind farm export cable route which will make landfall at Thorntonloch.

87 The following sub-sections summarise information relevant to the proposed cable route.

17.5.2.1 Navigational Features

88 The proposed cable route intersects military practice and submarine exercise areas as identified in Figure 17.3. Figure 17.16 presents the anchorage areas and other navigational features relative to the proposed route in more detail.

89 The nearest harbour to the proposed cable land fall is Cove Harbour (a small fishing harbour) approximately 2.5 NM to the southeast. The closest anchorage area is Dunbar Roads located approximately 6 NM west-northwest of the cable route.

90 It is also highlighted that the proposed cable landfall at Thorntonloch lies between two MEHRAs located at Dunbar (approximately 5 NM to the northwest) and St Abb's Head (approximately 4 NM to the south-southeast).

17.5.2.2 Shipping Survey Area

91 As noted in Section 17.3.2, the main shipping data were collected from a geo-technical survey vessel operating within the Neart na Gaoithe wind farm for approximately 29 days from August to October 2011. Given Neart na Gaoithe wind farm is located within approximately 15 NM of the cable route landfall, AIS shipping data covered the Thorntonloch export cable route (radar coverage was less comprehensive at this range).

92 In addition, to provide comprehensive data on vessel anchoring over seasonal fluctuations, the FTOWDG coastal AIS data were analysed during a more recent period of data collection (November 2010 to July 2011) to validate the findings of the geo-technical survey data.

17.5.2.3 Shipping Analysis

93 An overview of the AIS shipping data recorded in August to October 2010 relative to the proposed export cable route is presented in Figure 17.17.

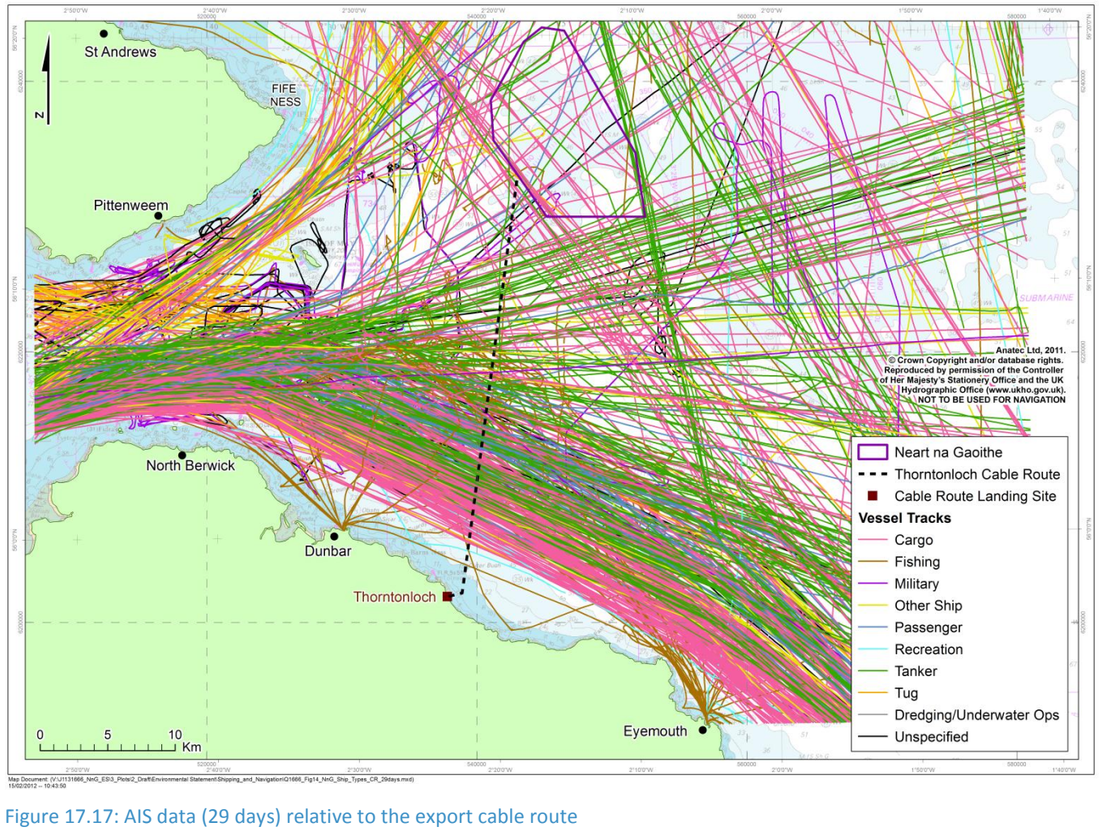

Figure 17.17: AIS data (29 days) relative to the export cable route

94 It can be observed that the proposed export cable route from Neart na Gaoithe to Thorntonloch is intersected by a busy shipping route headed in/out of the Firth of Forth from the south. The route mainly comprises tankers and cargo vessels headed to marine terminals and ports inside the Forth (i.e., Leith, Rosyth and Grangemouth).

95 A second less trafficked route largely composed of tankers travelling between northern Europe/Scandinavia inbound to the Firth of Forth also intersects the northern section of the proposed cable route.

96 It is also noted that within 2.5 NM of the Thorntonloch landfall point there are limited merchant vessel tracks given water depth restrictions (depths increase to an average of 15 m within 2 NM of the landfall) off the East Lothian and North Berwick coastline.

97 Figure 17.18 presents the anchored vessels recorded from the geo-technical survey within 10 NM of the proposed Thorntonloch cable route.

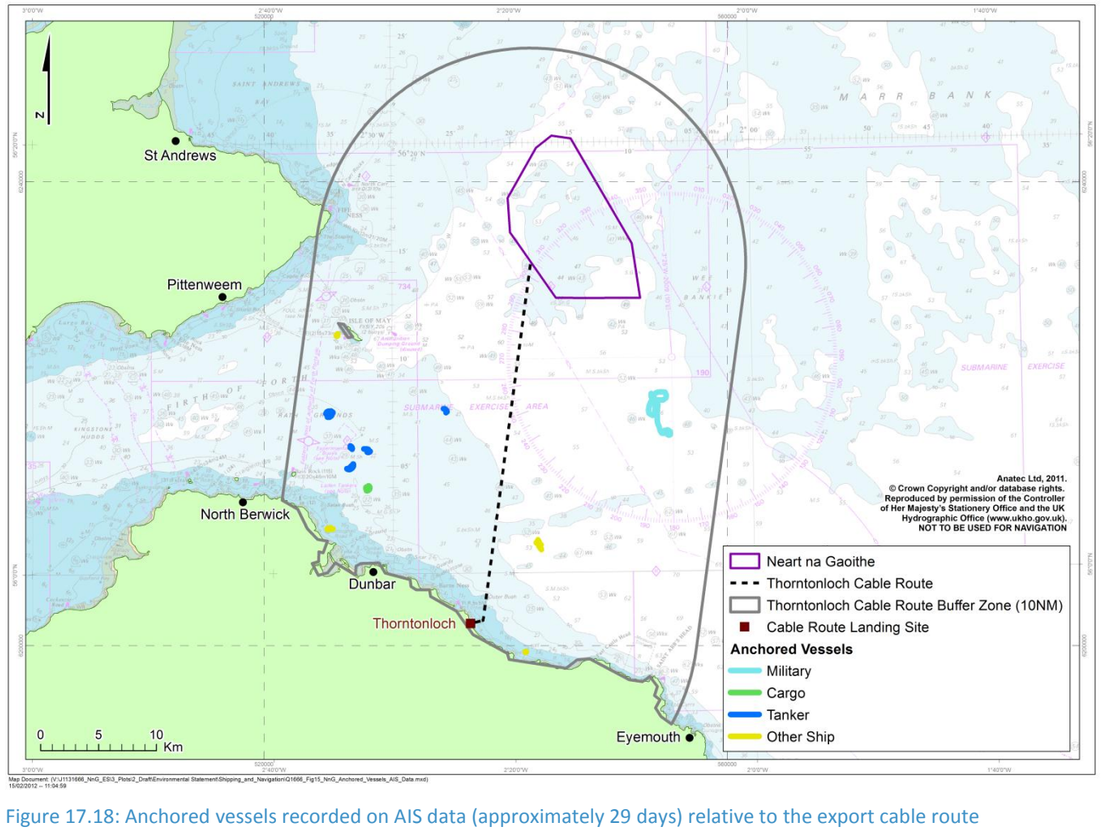

Figure 17.18: Anchored vessels recorded on AIS data (approximately 29 days) relative to the export cable route

98 It can be observed that a number of vessels were recorded at anchor approximately 6 to 8 NM west of the proposed cable within 3 NM of the Forth Ports Authority harbour limit.

99 The two closest vessels recorded anchored off the proposed cable route were a Fisheries Protection Research vessel located approximately 2 NM east of the proposed cable and a tanker located 3 NM west of the cable.

100 Figure 17.19 presents the anchored vessels recorded from the longer term coastal survey data within 10 NM of the proposed cable route.

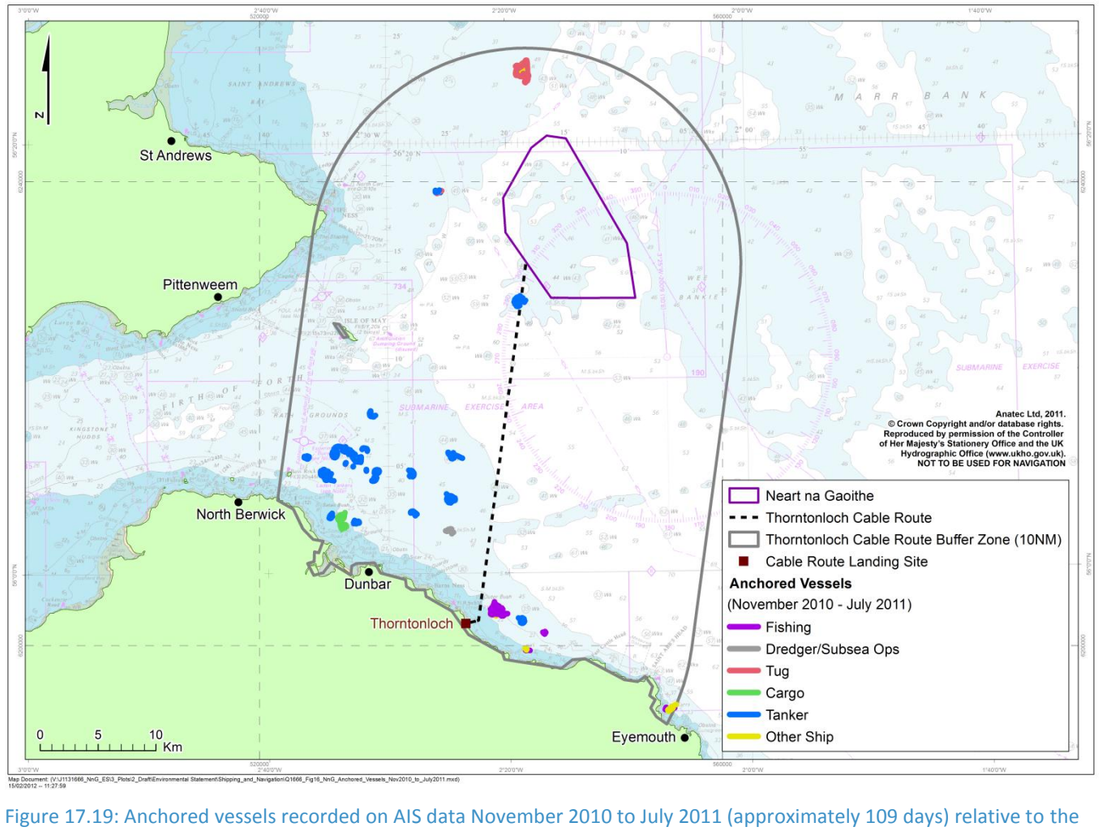

Figure 17.19: Anchored vessels recorded on AIS data November 2010 to July 2011 (approximately 109 days) relative to the export cable route

101 The longer term AIS data also show a number of vessels were recorded at anchor approximately 6 to 8 NM west of the proposed export cable within 8 NM of the Forth Ports Authority harbour limit.

102 A 250 m crude oil tanker was recorded for two days anchoring near the proposed cable approximately 1.7 NM south of the wind farm. A Fisheries Protection Research vessel was also recorded (for a second time during the surveys) approximately 1.3 NM east of the cable.

17.5.2.4 Fishing Vessel Activity

103 A plot of the fishing vessel tracks recorded on AIS during the shipping survey (August to October 2010) is presented in Figure 17.20.

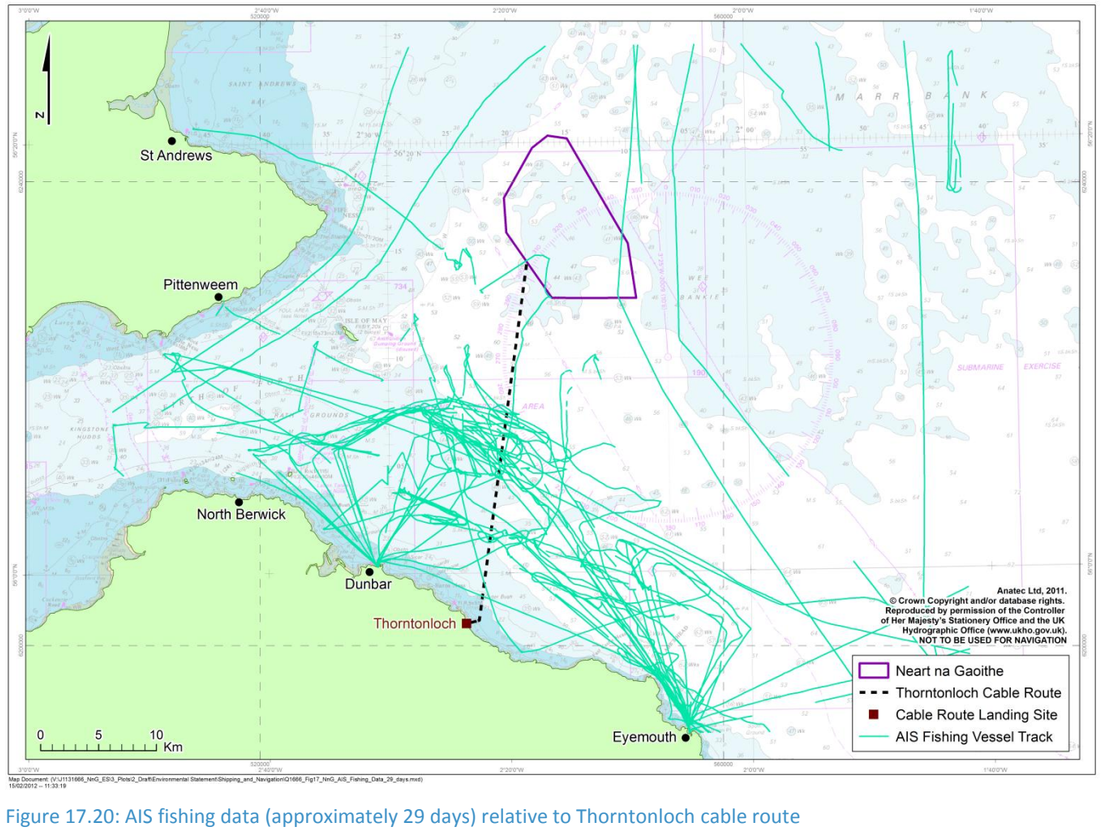

Figure 17.20: AIS fishing data (approximately 29 days) relative to Thorntonloch cable route

104 It can be observed that the AIS fishing vessel tracks were recorded heading in/out of nearby fishing ports including Dunbar and Eyemouth. An area of fishing activity was also recorded intersecting the proposed export cable route approximately 8 NM north of the cable landfall.

17.5.2.5 Recreational Vessel Activity

105 Recreational activity relative to the proposed export cable route corridor is presented in the RYA/CA atlas and survey data recorded during August to October 2010.

106 A plot of the recreation vessel tracks recorded on AIS during the shipping survey (August to October 2010) is presented in Figure 17.21.

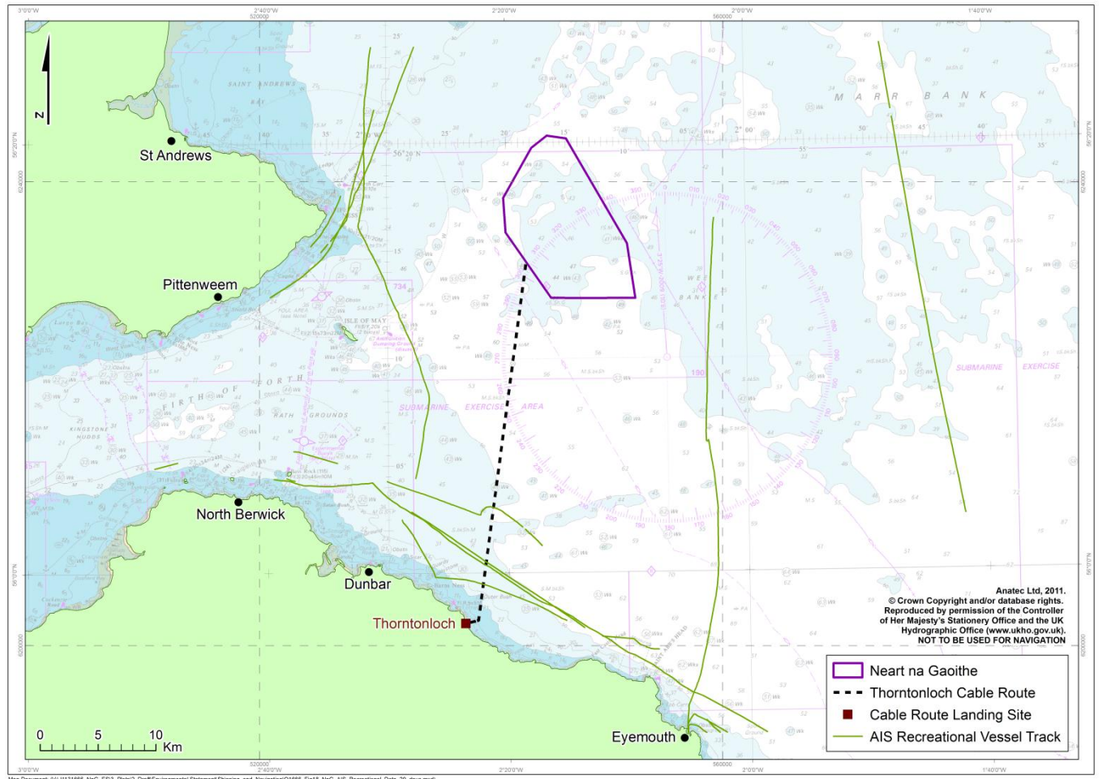

Figure 17.21: AIS recreation data (approximately 29 days during August – October 2010) relative to the export cable route

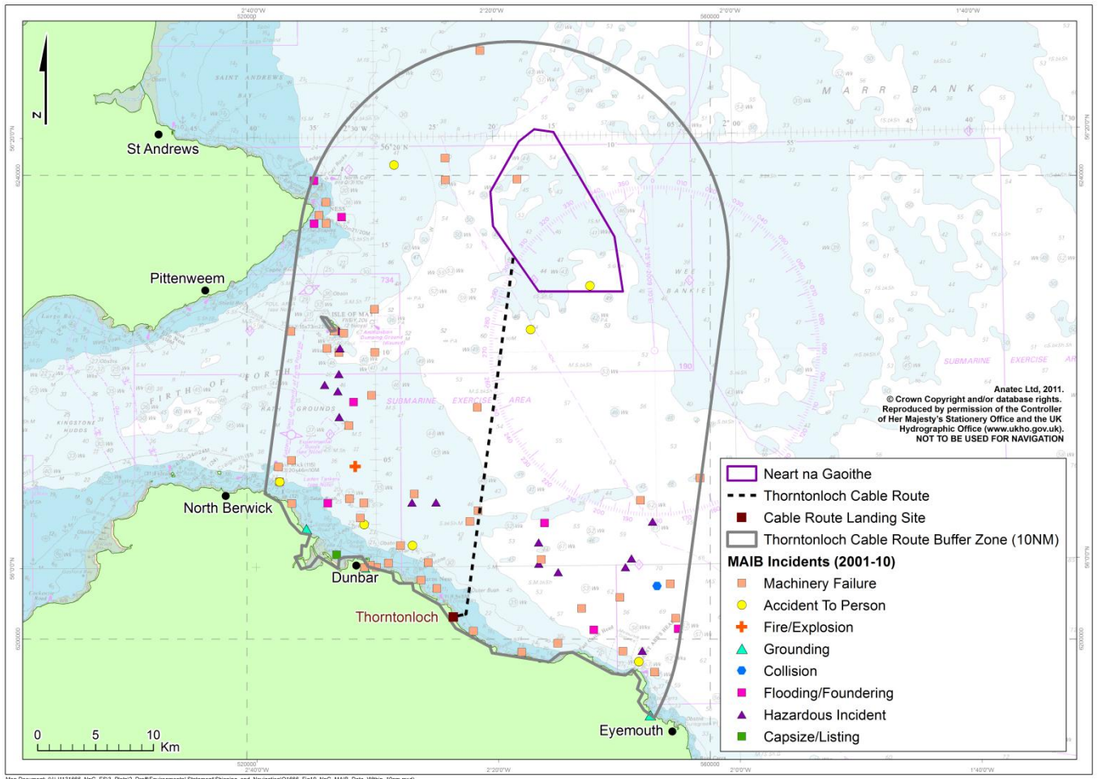

Figure 17.22: MAIB data (2001 – 2010) by type within 10 NM of Neart na Gaoithe export cable route

107 It can be observed that a number of AIS recreation sailing vessels were recorded heading along the coast intersecting the cable route off St Abb's Head and Dunbar. A small number of vessels were also recorded passing inside Bass Rock.

Royal Yachting Association Data

108 Recreational activity based on the latest RYA data (2010) is presented in Figure 17.21. In terms of the export cable route, two 'medium-use' cruising routes intersect the proposed cable, a coastal route between Eyemouth and Dunbar, and a longer distance offshore route between the Forth/Tay and marinas of northeastern England.

17.5.2.6 Maritime Incidents

Marine Accident Investigation Branch Data

109 The locations of accidents, injuries and hazardous incidents reported to MAIB within 10 NM of the Neart na Gaoithe export cable route for the last ten years (January 2001 to December 2010) are presented in Figure 17.22, colour-coded by type.

110 A total of 86 unique incidents were reported within 10 NM, corresponding to an average of nine per year. The three nearest incidents to the proposed cable route were machinery failures, occurring within approximately 0.8 NM of the route.

Royal National Lifeboat Institution Data

111 Data on RNLI lifeboat responses within 10 NM of the Neart na Gaoithe offshore wind farm export cable route in the ten-year period between 2001 and 2010 have been analysed.

112 A total of 416 launches to 495 separate incidents were recorded by the RNLI (excluding hoaxes and false alarms). Figure 17.23 presents the geographical location of incidents colour-coded by casualty type.

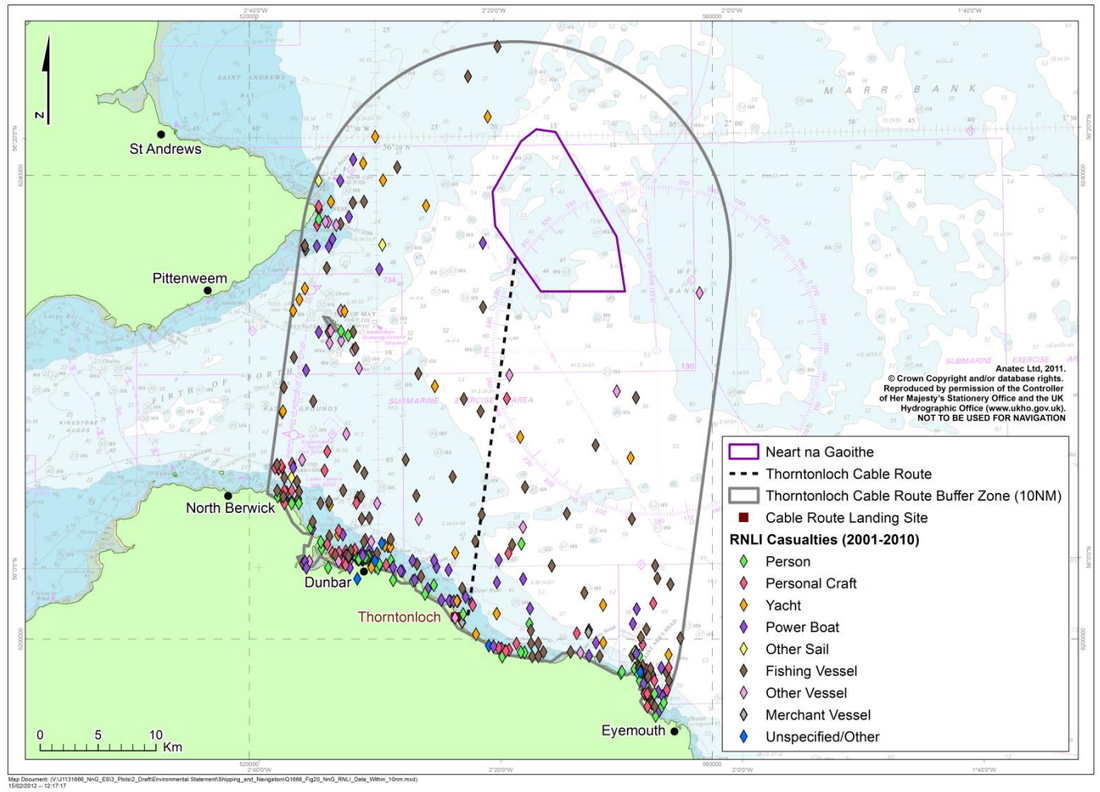

Figure 17.23: RNLI data (2001 – 2010) by type within 10 NM of Neart na Gaoithe export cable route

113 There was an average of 41 RNLI incidents recorded within 10 NM of Neart na Gaoithe export cable route from 2001-2010, with the large majority of incidents recorded along the coastline between St Abb's Head and Dunbar.

114 Seven incidents were recorded within 0.1 NM of the cable route over the 10 years analysed. Three incidents involved persons becoming stranded off the beach, two involved fishing vessels (machinery failures), a large power boat had machinery failure and an unspecified vessel capsized 0.1 NM from the landfall location.

17.5.2.7 Search and Rescue

Search and Rescue Helicopters

115 A review of the assets in the area of the cable route indicated that the closest SAR helicopter base is located approximately 42 NM south-southeast at Boulmer (Figure 17.14).

Royal National Lifeboat Institution Lifeboats

116 The proposed export cable route is likely to make landfall at Thorntonloch which is approximately 1.1 NM southeast of Skateraw (a lifeboat was stationed here until 1944), with Dunbar lifeboat station located approximately 5 NM to the west-northwest. It is noted that a low-water mooring berth is provided at Torness Harbour, south of Dunbar and the lifeboat is kept here when crossing the harbour entrance at Dunbar is not possible.

17.5.3 Future Shipping Changes

117 The main factor that is likely to influence the future levels and composition of shipping in the vicinity of the offshore site and cable route is traffic using the Firth of Forth/Tay Ports and vessels headed to ports in the north of Scotland including Aberdeen.

118 A number of ports and harbour facilities are located on the east coast of Scotland, including along the Firth of Forth, the River Tay and Aberdeen. A summary of the redevelopment works planned which could lead to increased level of shipping through the area is presented below:

- There are proposals for three biomass plants within the Firth of Forth and Tay region at Rosyth, Grangemouth and Dundee, which if constructed could bring in an increased number of large bulk carriers. At the time of writing (January 2012), 90% of cargoes were proposed to be from vessels. It is noted that Forth Energy has withdrawn the Leith site application, however, the proposal for Leith may be considered at a later date;
- The Port of Kirkcaldy re-opened for the import of wheat directly to a quayside tenant during March 2011. Additional construction work will include new silos and conveyors to allow the fast delivery of wheat from coastal ships;
- A new international container terminal is proposed on land that was reclaimed at Rosyth;
- The port of Leith continues to be redeveloped with plans to carry out technical and feasibility studies for the port; and
- Aberdeen Harbour commenced a Torry Quay redevelopment plan in April 2010. Future uses of the new facility could include a support base for oil and gas customers and the handling of equipment for offshore renewable energy installations.

119 To assess the potential impact of the offshore development in the future, it has been predicted that there will be an increase in shipping movements within the area based on harbour and port redevelopments, as noted above. Therefore, it has been assumed that over the life of the Neart na Gaoithe development, there will be a 10% increase in shipping movements.

17.6 Impact Assessment

17.6.1 Introduction

120 The baseline assessment identified higher risk areas through the maritime traffic survey, desk-based research and consultation. Following this, a FSA was carried out in line with the IMO FSA process (IMO, 2002) and DECC guidance (DECC, 2011).

121 This impact assessment summarises the relevant sections of the risk assessment:

- Hazard log and risk ranking;
- Quantified NRA for selected hazards;
- Base Case and Future Case risk levels assessed for selected hazards;
- SAR review; and
- Assessment of mitigation measures.

122 Risk assessment was carried out on the higher risk scenarios to investigate the selected hazards in more detail. This allows more attention to be focused upon the high risk areas to identify and evaluate the factors which influence the level of risk with a view to their effective management.

123 Consequently, the main part of the assessment covers the potential impacts on shipping and navigation in relation to commercial ships, recreation routeing and fishing vessels. SAR resources and radar impacts are assessed for the operational phase of the project.

17.6.2 Hazard Review Workshop

124 A hazard review workshop for the navigational risks associated with the Neart na Gaoithe offshore wind farm was held in Rosyth on 4 November 2011 attended by local maritime stakeholders. The key maritime hazards associated with the wind farm development were identified and associated scenarios prioritised by risk level (full details of the workshop methodology and results can be found in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment).

125 The ranking of the risks associated with the various hazards was carried out using a risk matrix, as presented in Figure 17.24.

Figure 17.24: Risk ranking matrix

126 A description of the risk matrix regions is provided in Table 17.4.

Risk Region	Description
Broadly Acceptable Region (Low Risk)	Generally regarded as not significant and adequately controlled. Nonetheless, the law requires further risk reductions if it is reasonably practicable. However, at these levels the opportunity for further risk reduction is much more limited.
Tolerable Region (Intermediate Risk)	Typical of the risks from activities that people are prepared to tolerate to secure benefits. There is, however, an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are as low as is reasonably practicable (ALARP) and the risks are periodically reviewed to check if further controls are appropriate.
Unacceptable Region (High Risk)	Generally regarded as unacceptable whatever the level of benefit associated with the activity.

Table 17.4: Risk matrix description

127 The following list of hazards was reviewed, with the information recorded using in-house Hazard Log Software:

- Fishing vessel collision;
- Commercial ship (powered) collision;
- Recreational vessel collision;
- Drifting ship collision;
- Fishing gear interaction with subsea equipment (within the wind farm);
- Vessel anchoring on or dragging anchor over subsea equipment/cables;
- Vessel-to-vessel collision due to avoidance of site or work vessels in area;
- Fishing gear interaction with export cable;
- Attendant vessel collision with structure;
- Man overboard during work activities at site;
- Dropped object during work activities at site; and
- Deliberate unauthorised boarding or mooring to structure (and damage to device).

128 Based on the probable (most likely) outcome ten hazards were ranked as broadly acceptable (low risk). The hazards ranked as tolerable (assuming appropriate safety control measures are in place) based on probable outcome were defined as attendant vessel collision with wind farm structure and man overboard during transfer to/from turbine or working alongside turbine.

129 As well as the two hazards ranked as tolerable based on probable outcome, four additional hazards were ranked as tolerable based on worst case outcome:

- Dropped object during construction, decommissioning or major maintenance;
- Vessel-to-vessel collision due to avoidance of site;
- Anchor on or dragging over subsea equipment; and
- Fishing vessel collision.

130 The remaining six risks were ranked as broadly acceptable for the worst case outcome.

131 Several of the tolerable and worst case outcomes involve third party vessels, and, hence, have a lower likelihood of occurring. In addition, it is not known at this stage if there will be guard vessels used during construction/decommissioning phases. Fishing vessels can be used as guard vessels, which can identify errant vessels on collision courses with structures or construction works, reducing the risk of collision.

17.6.3 Impact Assessment – Construction

17.6.3.1 Site-Specific Assessment

132 In general, whilst the same impacts exist as during the operational phase, there are additional impacts associated with the construction phase of the project that require additional risk control measures.

133 There will be an increased level of vessel activity within the Neart na Gaoithe wind farm area during the construction phase (including transfer vessels, jack-ups/barges and larger vessels known as mothership(s) which can provide accommodation, workshops, storage and lifting capacity), and along the export cable route. Motherships will generally remain on site for the duration of the construction period. The presence of construction vessels within the area is likely to pose an additional navigational risk, although such vessels can also provide on-site emergency response and assist in risk mitigation.

134 The overall impact associated with constructing the Neart na Gaoithe wind farm and export cable works in terms of shipping and navigation has been identified and discussed in the following subsections.

Impact on Commercial Shipping

135 Based on the analysis of shipping data the majority of traffic passes clear of the site, on shipping routes east/west from the Firth of Forth and coastal traffic off Fife Ness. Two regionally important routes (medium sensitivity) could be affected during the construction phase, including the northwest/southeast shipping lane to/from the Firth of Tay and traffic between the Humber and northern Scottish Ports (including Aberdeen, Peterhead and Lerwick).

136 The majority of vessels are small to medium sized tankers and cargo vessels, and are likely to pass approximately 1 NM east and/or west of the wind farm during construction activities. There is sufficient sea room for vessels to make this deviation from the current routes with a partial loss or alteration to lower use navigable routes. However, the routes may narrow slightly, as vessels pass around construction activities, and the impact of this deviation is predicted to be of ***minor significance***.

Impact on Fishing Vessel Navigation

137 A full assessment of the potential impacts on commercial fishing vessels and activities in the vicinity of the proposed wind farm are described in Chapter 16: Commercial Fisheries.

138 Fishing vessels could be impacted during the construction phase of the project in terms of vessel routeing, transit time and collision risk as temporary exclusion zones will be implemented during turbine installation. From the maritime surveys, a small number of fishing vessels (generally less than 25 m in length) were recorded transiting through the offshore site. The majority of fishing activity (mainly demersal trawlers and scallop dredgers) were recorded approximately 1 NM to 8 NM southwest of Neart na Gaoithe.

139 Fishing vessels on local and regionally important routes of low sensitivity will be aware of construction works at Neart na Gaoithe wind farm through NtMs and fisheries liaison. Vessels should be able to make deviations around the main construction works leading to a partial loss of lower use navigable routes. Therefore, the overall impact on fishing vessel routeing is likely to be of ***minor significance*** given available sea room east and west of the offshore site.

Impact on Recreation Routeing

140 Based on the analysis of recreational sailing data, one vessel (non-AIS) was recorded passing through Neart na Gaoithe wind farm, with the majority of tracks recorded passing between Isle of May and Fife Ness (6 NM west of the site). One medium use RYA cruising route also passes through Neart na Gaoithe and based on the RYA definition, medium use cruising routes are "popular routes on which some recreational craft will be seen at most times during summer daylight hours." Overall, recreational sailing within the area of the offshore site tended to be low (as recorded from the shipping surveys). However, activity will fluctuate based on sea and weather conditions and public holidays.

141 Recreational vessels on the medium use cruising route should be able to pass between the main construction works and safety zones in suitable conditions (i.e., during good visibility and calm sea conditions), as well as being able to pass inshore and offshore of the wind farm. Based on the activity review, this is not expected to be a frequent event; however, there will be a minor shift from baseline conditions on a regionally important cruising route. Therefore, given that a medium use cruising route passes through the offshore site and vessels will deviate around construction works, the impact on recreational vessels is considered to be of ***minor significance***.

17.6.3.2 Cable Route

Impact on Commercial Shipping

142 The presence of cable laying vessels within the proposed export cable corridor can pose additional risk to navigation. This is mainly due to increased vessel activity and the fact that cable laying vessels are restricted in manoeuvrability, leading to potential increase in close vessel encounters (i.e., <1 NM) and risk of collision.

143 The proposed export cable route corridor is intersected by approximately 15 vessels per day with the large majority of ships associated with the Firth of Forth ports. This is a relatively large route, with 90% of the shipping intersecting the cable corridor in a 6-7 NM wide shipping lane approximately 2 NM from the cable landfall. It is considered that the shipping on the Firth of Forth route is of medium sensitivity; given this is a nationally important shipping route, trafficked by a high number of vessels.

144 The cable laying works are temporary in nature and assuming industry standard management and mitigation procedures are in place and adhered to (see Section 17.7 and Table 17.5), it is predicted that cable laying works can be carried out safely, with a slight change in the baseline shipping and navigation routeing and collision risk. Fishing vessels will be able to deviate around cable laying works, given the available sea room. Overall it is predicted that the impact on commercial shipping will be of ***minor significance***.

Impact on Fishing Vessel Navigation

145 Local fishing vessels will be aware of installation and cable laying vessels within the area of the offshore works through NtMs and fisheries liaison. Non-local fishing vessels will become aware of the cable laying activities as they arrive at fishing grounds through day marks and lights used by the cable laying vessels to warn passing vessels of restrictions in manoeuvrability. Therefore, fishing vessels should be able to re-route around installation vessels in minor sensitive routes (i.e., coastal routes to local fishing ports), with a minor deviation or alteration to current routes.

146 Assuming industry standard management and mitigation procedures, it is expected that cable laying works can be carried out safely, with a navigational impact of ***minor significance*** to fishing vessel activities.

Impact on Recreation Routeing

147 Four recreation vessels were recorded on AIS headed along the East Lothian coast during the 29 day survey, and two medium use cruising routes intersect the proposed export cable route.

148 Overall, a small change is predicted in terms of recreation vessel routeing distance and time on the coastal cruising routes, as vessels deviate around cable laying vessels. There is available sea room off the coast for passing around installation vessels, and given the temporary nature of cable laying and assuming industry standard mitigations, the impact on recreation routeing is predicted to be ***not significant***.

17.6.4 Impact Assessment – Operation and Maintenance

17.6.4.1 Site-Specific Assessment

149 A revised ship routeing pattern following construction of the Neart na Gaoithe offshore wind farm has been estimated based on the review of the baseline shipping data and information recorded during the Hazard workshop. Four risk assessments were carried out as outlined below:

- Base Case without wind farm level of risk;
- Base Case with wind farm level of risk;
- Future Case without wind farm level of risk; and
- Future Case with wind farm level of risk.

150 The following scenarios were investigated in detail:

- Vessel-to-vessel collisions; and
- Vessel-to-wind farm structure collisions (powered and drifting).

151 The fishing vessel-to-wind farm collision model inputs are based on fishing vessel density, from the shipping surveys, and the wind farm structure details, total area. It also assumes the fishing vessel density following wind farm development will remain the same as current levels.

152 The overall impact associated with Neart na Gaoithe in terms of shipping and navigation, SAR resources and radar impacts are assessed for the operational phase of the project.

Impact on Commercial Shipping

153 The main impact on commercial shipping is the displacement of ships passing close to the wind farm area on approach/departure from the Firth of Tay and vessels on the route from the north (Aberdeen, Peterhead and Orkney/Shetland Isles) to the Humber.

154 The current position of the two routes and survey tracks is presented in Figure 17.25, including the worst case maximum number of turbines in indicative Layout A.

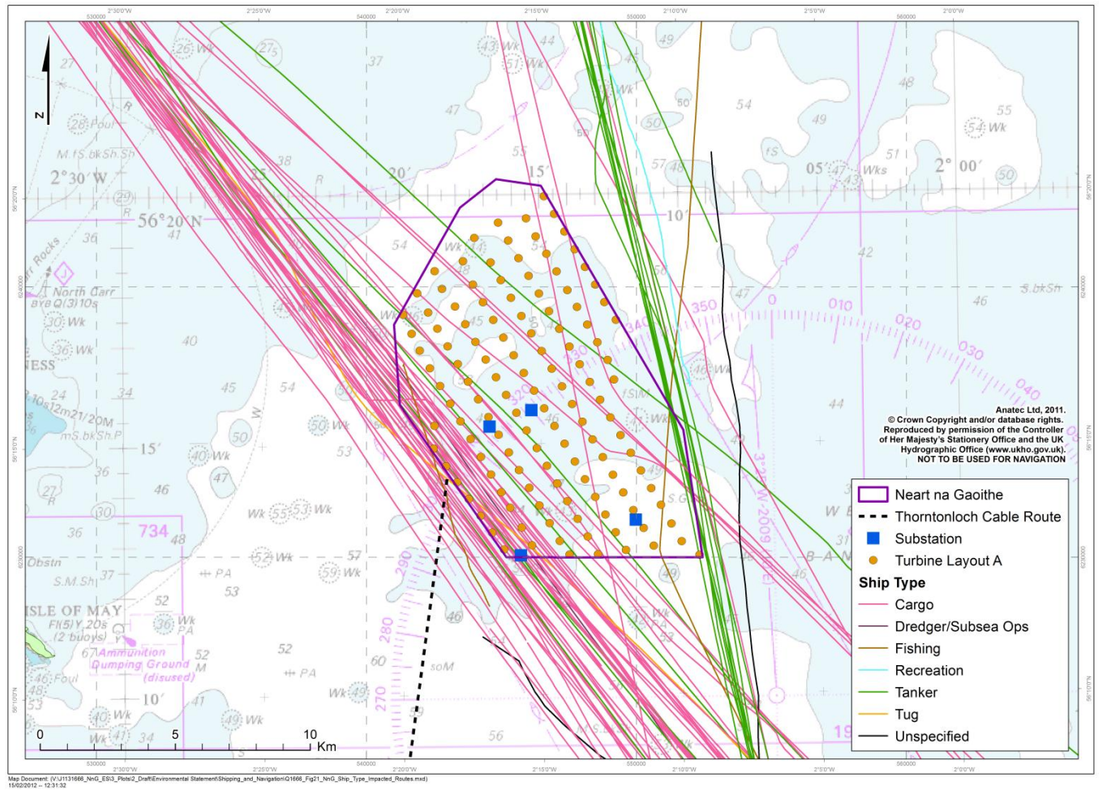

Figure 17.25: Detailed plot of survey tracks by ship type on impacted routes (August to October 2010: 29 days)

155 Less than one vessel per day on average uses the Firth of Tay route, with approximately one vessel every three days on the coastal route from Humber to northern Scotland.

156 Vessels currently using the medium sensitivity Firth of Tay route are likely to deviate to the west, which will result in an increased mean passing distance of approximately 1 NM. There is sufficient sea room for vessels to make this minor alteration. The route is also expected to narrow slightly leading to a small increase in vessel-to-vessel collision risk. Overall an impact of ***moderate significance*** is predicted for vessels on this route.

157 The tanker route is also expected to make a minor deviation from Neart na Gaoithe, at a distance of approximately 1 NM (east). However, it was noted that over the period of shipping data collection, vessels tracks were recorded at various distances from the site, generally passing further east of Neart na Gaoithe. Therefore the mean ship route position was considered over the entire period of data collection (coastal and vessel survey), see Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment. Given the increased collision risk during the operation phase of the project and deviation from the current route an impact of ***moderate significance*** is predicted.

158 Figure 17.26 presents the current and anticipated route positions for the closest ship tracks passing Neart na Gaoithe.

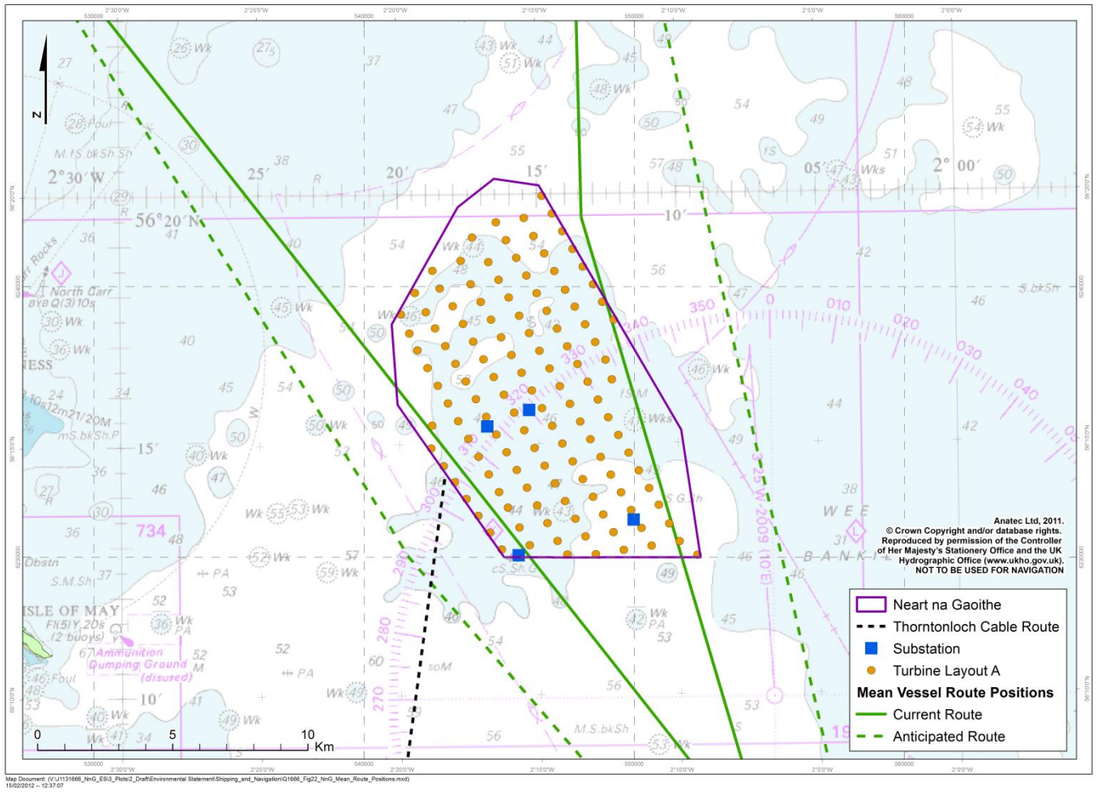

Figure 17.26: Current and anticipated mean route positions relative to indicative Layout A

159 The baseline vessel-to-vessel collision risk level, pre-wind farm development, is in the order of one major collision in 1,020 years and modelling the revised traffic pattern (with wind farm), the collision risk was estimated to increase to one major collision in approximately 970 years. The change in collision frequency due to the wind farm was estimated to be 4.6×10^{-5} per year or approximately one in 20,000 years (5% increase). Overall, it is considered that there will be an impact of ***moderate significance*** on commercial shipping collision risk given the nationally important routes in the area and the increase in collision risk from baseline conditions.

160 In terms of an errant vessel under power deviating from its route to the extent that it comes into proximity with Neart na Gaoithe wind farm, it is not considered to be a probable event (worst case collision return period of one every 8,200 years for the whole site based on indicative Layout A). This is low compared to the historical average of 5.3×10^{-4} per installation-year for offshore installations on the United Kingdom Continental Shelf (UKCS) (one in 1,900 years). The structures with the highest individual collision frequencies were on the southern and eastern edge of the site, given the closer proximity to ship routes heading in/out of the Firth of Forth.

161 The worst case drifting collision risk has been identified as one every 34,000 years. Drifting collisions are assessed to be less frequent than powered collisions, which is reflective of historical data. There have been no reported 'passing' drifting ('Not under Command') ship collisions with offshore installations on the UKCS in over 6,000 operational years (since the late 1960s there have been oil and gas installations on the UKCS – the operational years are calculated as the number of installations x number of years each installation is operational).

162 Whilst a number of drifting ship incidents are recorded each year in UK waters, most vessels have been recovered before a collision occurs (e.g., anchored, restarted engines or taken in tow). The majority of the drifting vessel collision frequency for the offshore site is associated with the more southerly wind farm structures. The turbines on the southern edge of the wind farm have higher individual collision frequencies since the predominant wind direction is southwesterly and there is a high density of shipping headed in/out of the Firth of Forth.

163 In terms of vessel-to-vessel collisions there will be a moderate impact on commercial shipping. However, the level of vessel-to-wind farm structure collisions (powered and drifting) with Neart na Gaoithe is below the historical average for platforms in the UKCS and there will be only a minor change in collision frequency from baseline conditions, therefore an impact of ***minor significance*** is predicted. The overall significance assumes ships will be able to pre-plan their revised passage in advance of encountering the wind farm and that industry standard mitigation will be in place (see Table 17.5).

164 Overall, taking into account the impact of vessels revising routeing around Neart na Gaoithe and the results of modelling the ship-to-ship collisions and ship-to-wind farm structure collisions, the impact on commercial shipping from Neart na Gaoithe is considered to be of ***moderate significance***.

Impact on Fishing Vessel Navigation

165 A detailed study of the impacts on fishing activity and grounds in the vicinity of Neart na Gaoithe has been performed as part of the Commercial Fisheries Assessment (Chapter 16: Commercial Fisheries).

166 In terms of fishing vessel navigation, the impacts on vessels transiting through the area can be considered similar to other passing vessels (i.e., commercial vessels). Vessels may need to deviate around the site leading to increased transit times in low sensitivity coastal routes. However, it is noted that due to the smaller sizes of these vessels and the spacing between turbines, there is good prospect for fishing vessels to navigate within the wind farm and a minor shift from baseline conditions is predicted. It is noted that a master (skipper) may decide to navigate through a wind farm; however this decision is likely to be based on the type and size of fishing vessel and sea, weather and visibility conditions at the time. Overall, an impact of ***minor significance*** is predicted on fishing vessel routeing assuming industry standard procedures are followed.

167 Based on the analysis of fishing data, a relatively high density of fishing activity was recorded to the southwest of Neart na Gaoithe. During the operational phase of the project, there is a risk of a fishing vessel colliding with a structure within the wind farm. The worst case fishing vessel to wind farm structure collision risk has been identified as one every 57 years[1]. The estimated collision frequencies are high and reflect the maximum target area (for all the structures in indicative Layout A), based on jacket foundations. Given, the relatively high fishing vessel to wind farm structure collision frequency, an impact of ***moderate significance*** is predicted, assuming industry standard procedures are followed.

168 Overall, taking into account the impact on fishing vessel routeing and the results of modelling the ship-to-wind farm structure collisions, the navigational impact on fishing vessels from Neart na Gaoithe is considered to be of ***moderate significance***.

Impact on Recreation Routeing

169 The air clearance between turbine rotors and sea level conditions at Mean High Water Springs (MHWS) will not be less than 22 m, as recommended by the MCA. This minimises the risk of interaction between rotor blades and yacht masts.

170 In terms of vessel routeing, increased transit times and collision risk, there is one medium use cruising route passing through Neart na Gaoithe. Vessels should be able to pass between turbines in suitable conditions (i.e., during good visibility and calm sea conditions). However, vessels may be required to deviate inshore (west) and offshore (east) of the offshore site during adverse weather or when major maintenance vessels are on site.

171 Based on the activity review one vessel intersected Neart na Gaoithe during the survey. Vessels may also use the regionally important cruising route that passes through the offshore site leading to an increased risk of collision with a structure. However, dependent on sea and weather conditions, it is not expected to be a frequent event and the overall impact, assuming industry standard procedures are followed (Table 17.5), is considered to be of ***minor significance***.

Impact on Search and Rescue

172 Neart na Gaoithe lies within the Scotland and Northern Ireland SAR region with the nearest rescue coordination centre located at Marine Rescue Coordination Centre (MRCC) Forth. It is noted under the revised MCA SAR proposals, 'Consultation on Revised Proposals for Modernising the Coastguard' (MCA, 2011), the nearest centre will become Aberdeen Marine Rescue Sub Centre (MRSC). MRCC Forth is predicted to close by the end of financial year 2012/13, with the national proposals put in place by 2015.

173 In the event of an emergency arising, within or adjacent to Neart na Gaoithe, the main types of SAR would be carried out by RNLI ALBs (from either Anstruther, Dunbar or Arbroath) and/or SAR helicopter from Boulmer.

174 A review of historical incidents indicated that the incident levels in the vicinity of Neart na Gaoithe and associated export cable route have tended to be low. In terms of SAR issues, given the relatively low level of historical accidents in the area it is considered unlikely that the operational phase of Neart na Gaoithe and the associated export cable will exacerbate maritime safety risks in the area.

175 Giving account to the design features associated with the wind farm, and commitments to meet MGN 371 (MCA, 2008a) and industry best-practice, including the development of an ERCoP pre-construction, it is predicted that SAR issues can be well managed.

176 It is considered that SAR operations will not be significantly impacted by the offshore site in terms of routeing and transit time, as an ALB will be able to navigate through a wind farm (dependent on sea state and weather conditions). In addition, a lifeboat and SAR helicopter will be launched to respond to an incident (based on incident severity).

177 Therefore, it is anticipated that the impact on SAR in terms of access and response time will be minor leading to an impact of ***minor significance***.

Impact on Marine Radar Systems

178 Trials on the impact of offshore wind farms on marine radar systems have been carried out at North Hoyle (QinetiQ and MCA, 2004) and Kentish Flats (BWEA, 2007). The results of the North Hoyle and Kentish Flats trials indicate that the onset range from the wind turbine structures of false returns is about 1.5 NM, with a progressive increase in the impact of the effects on radar to about 500 m.

179 The physical presence of the offshore site may cause interference with the navigational position fixing aids (such as radars) for all sea users, including vessels on the low sensitivity Firth of Tay route, coastal tankers passing east of Neart na Gaoithe and recreation/fishing vessels transiting the area (further details of radar impacts can be found in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment). Shipping associated with the Firth of Tay, coastal tankers (east of Neart na Gaoithe) and a number of vessels headed into the Firth of Forth (south of the site) pass inside the 1.5 NM range from the turbines in indicative Layout A (worst case). On these routes a small level of radar interference could be experienced; however, based on the revised routeing patterns around the wind farm, radar interference is predicted to be low. In addition, given the low number of recreation and fishing vessels passing through the offshore site, it is considered unlikely that smaller vessels will exit the wind farm into busier shipping routes without being observed.

180 Vessels inbound and outbound from ports in the area (including Firth of Forth and Tay) are also likely to be attentive and aware of hazards in the area given they may be preparing the vessel for entering port, pilotage or checking/securing the vessel for steaming through open sea. It is noted that structures within the Neart na Gaoithe wind farm could also be used to aid navigation in the area. It was found that during the Kentish Flats trials, the use of an easily identifiable reference target (a small buoy) can help the radar operator select the optimum radar settings whilst passing an offshore wind farm.

[1]The FV Collision model is for powered collisions. The FV collision risk is similar to that for offshore studies we have carried out (i.e. <100 yrs). The model assumes fishing activity will continue as per current levels, which is conservative given uncertainty over future fishing effort and assessment of worst case.

181 Overall, it was concluded that the impact of radar interference on marine radar systems used by commercial and smaller vessels navigating around the offshore site and through the wind farm will be of ***minor significance***.

17.6.4.2 Cable Route Assessment

Impact on Commercial Shipping

182 The proposed export cable route to shore runs from the southern boundary of Neart na Gaoithe and is crossed by a busy shipping lane associated with the Firth of Forth. Due to the draughts of these ships and water depth, vessels tend to keep at least 2 NM to 2.5 NM north of the coast, clear of shallower areas where there may be the risk of grounding.

183 In terms of the impact to vessel anchoring, displacement and risk of dragging anchor, it is expected that following installation of the export cable and marking on Admiralty charts, vessel anchoring activity is likely to migrate east and/or west of the cable. Therefore there will be a small shift from baseline conditions, and the overall risk of dragging anchors onto the cable is considered to be minor.

184 It is noted that there are a number of alternative anchorages marked on Admiralty charts. Therefore an impact of ***minor significance*** to shipping and navigation anchoring practices and risk of dragged anchor is anticipated during operation of the export cables, assuming industry standard procedures are followed including cable burial or trenching.

Impact on Fishing Vessel Navigation

185 The impact on fishing vessels in terms of loss of fishing grounds is assessed in the Commercial Fisheries Assessment (Chapter 16: Commercial Fisheries).

186 In terms of fishing vessel safety, the main risk is related to gear snagging on unprotected cables or those running over spans, (i.e., gaps between the cable and the seabed due to seabed formation), leading to damage/loss of gear or even the fishing vessel. The predominant fishing activity in the vicinity of the offshore works is demersal trawling and scallop dredging; with the highest density of fishing activity recorded to the southwest of the offshore site.

187 It was confirmed during the navigation hazard workshop that proposed export cables to shore will be protected via burial or rock dumping, reducing the risk of fishing gear snagging. In addition, if a problem is identified with cable burial/protection during surveying (e.g., cable movement) this will be reported to the fishing industry. Assuming cable protection and liaison with the fishing industry, it is considered that the presence of export cables and the risk of gear damage from Neart na Gaoithe will result in a navigational impact of ***minor significance*** to fishing vessels.

Impact on Recreation Routeing

188 Electromagnetic interference on ship-borne equipment including compasses has been identified as a potential impact to small vessels when in close proximity to ferrous structures or high voltage cables.

189 The export cables will be buried (where possible) and any generated electromagnetic fields will be very weak and the impact on navigation or electronic equipment is considered to be ***not significant***.

17.6.5 Impact Assessment - Decommissioning

17.6.5.1 Site-Specific Assessment

190 The potential impacts associated with decommissioning of the Neart na Gaoithe offshore wind farm and export cable will be entirely dependent upon the method used for decommissioning.

191 However, it is considered that the impacts on shipping and navigation are likely to be similar for both the construction and decommissioning stages for the shipping and navigation receptors.

17.7 Mitigation and Residual Impacts

17.7.1 Introduction

192 The following section presents industry standard mitigation measures which will be in place as part of the wind farm design and best practice mitigations which can be adopted to reduce the impact on shipping and navigation. Safety zones can also be applied for in line with DECC guidance (DECC, 2011) and these are described in Section 17.7.2.

193 The residual impact on shipping and navigation is presented in Table 17.6.

17.7.2 Safety Zones

194 Safety zones will be applied for around each turbine and construction vessels during the construction phase in order to minimise disruption to mariners and other users of the sea, including recreational vessels. These 500 m exclusion zones would be applied for in line with DECC guidance (DECC, 2011). Guard vessels may also be used to monitor passing vessels and warn/record any safety zone infringements.

195 Safety zones are likely to be established on a 'rolling' basis, covering only those areas of the offshore works in which such activities are actually taking place at a given time. Once that activity has been completed in that specific location, the safety zone will then 'roll on' to cover the next specific location within the site in which such activity is taking place.

17.7.3 Mitigation Measures

196 A summary of industry standard measures (i.e., measures which are required for the wind farm to successfully gain consent from a shipping and navigation perspective) and best practice mitigation measures identified throughout ES and within Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment, is provided in Table 17.5.

Type of mitigation	Mitigation	Explanatory notes
Industry Standard	Marked on Admiralty charts	Neart na Gaoithe will be charted by the UKHO using the magenta turbine tower chart symbol found in publication 'NP 5011 - Symbols and Abbreviations used in Admiralty Charts'. Submarine cables associated with Neart na Gaoithe will also be charted on the appropriate scale charts. Export cables will be charted by the UK Hydrographic Office on the appropriate scale charts and potential to note no anchorage areas over charted cables.
Industry Standard	Information circulation	Appropriate liaison to ensure information on the wind farm, export cable and special activities is circulated in NtMs, Navigation Information Broadcasts and other appropriate media.
Industry Standard	Marking and lighting	Neart na Gaoithe structures to be marked and lit in line with NLB and IALA (O-139) guidance. As per IALA, any lighting required for aeronautical purposes is to be shielded / arranged such that it is not visible to shipping. For further details and indicative lighting/marking see Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment.
Industry Standard	Turbine air draught	Lowest point of rotor sweep at least 22 m above MHWS as per the MCA recommendation.
Industry Standard	Cable protection (inter-array and export)	Cables will be protected appropriately taking into account fishing and anchoring practices. Positions of the cable routes notified to Kingfisher Information Services-Cable Awareness (KIS-CA) for inclusion in cable awareness charts and plotters for the fishing industry.
Industry Standard	Compliance with MGN 371 including Annex 5	Annex 5 specifies 'Standards and procedures for generator shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an OREI.'
Industry Standard	Formulation of an Emergency Response Co-operation Plan as per MCA template	Creation of an ERCoP based on the MCA template and site Safety Management Systems (SMS), in consultation with the MCA.
Best Practice	Marine Control Centre	A Marine Control Centre will monitor vessel activity (AIS and non-AIS) by Closed Circuit Television (CCTV) and record the movements of ships around Neart na Gaoithe as well as infield (company) vessels working at the wind farm. Possible errant vessels identified in construction areas or safety zones will be identified and contacted.
Best Practice	Subsea surveys of cables and burial depths	Periodic and planned surveys of cable routes to monitor burial depths/protection and seabed mobility (cable movement).
Best Practice	Safety zones and guard vessels	Construction safety zones of 500 m around major activities to exclude vessels not associated with the works from the offshore site. Guard vessels can be used to monitor passing traffic and contact vessels which could infringe the safety zones.

Table 17.5: Mitigation measures

197 The impact of Neart na Gaoithe has been minimised as industry standard risk control measures will be put in place during the development and operation of the offshore wind farm. These embedded mitigation measures will be part of the wind farm design (e.g., lighting/marking) and best practice mitigation measures will further serve to reduce the impact of the development and ensure the project conforms to regular requirements and industry good practice.

198 A description of each impact, mitigation and predicted residual impact significance is presented in Table 17.6.

Source	Pathway	Receptor	Significance assuming industry standard mitigation	Mitigation	Residual impact significance post additional mitigation	Explanatory notes
Physical presence of wind farm structures	Physical change in the environment due to wind farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Commercial shipping	Moderate significance	Best practice Marine Control Centre monitoring vessel activity and safety zones/guard vessels (Table 17.5).	Minor significance	Vessels should be able to pre-plan their voyage and based on analysis of shipping data there is available sea room east and west of the site for shipping to increase passing distance from wind farm structures.
	Physical change in the environment due to wind farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Fishing vessels	Moderate significance	Best practice Marine Control Centre monitoring vessel activity and safety zones/guard vessels (Table 17.5).	Minor significance	Vessels should be aware of the wind farm through liaison and consultation. Impacts on vessels steaming passed the site are similar to other passing vessels. However, there are good prospects for fishing vessels to navigate within the wind farm.
	Physical change in the environment due to wind farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Recreation vessels	Minor significance	Best practice Marine Control Centre monitoring vessel activity and safety zones/guard vessels (Table 17.5).	Minor significance	Vessels should be able to pass between turbines in suitable conditions, as well as being able to pass inshore and offshore of the wind farm. Based on the low level of recreational activity it is not expected to be a frequent event.
Physical presence of wind farm structures and subsea cables	The presence of structures, subsea cabling and increased levels of operation/maintenance vessels may lead to an increased number of SAR incidents. In addition, passing vessels will deviate around structures which may lead to increased collision risk (vessel-to-vessel and vessel-to-structure).	SAR resources	Minor significance	Best practice Marine Control Centre monitoring vessel activity and safety zones/guard vessels (Table 17.5).	Minor significance	Historical incident levels in the vicinity of Neart na Gaoithe and associated export cable route have tended to be low and it is considered unlikely that the development will exacerbate maritime safety risks in the area. In addition, ALBs are likely to navigate through the offshore site.
Physical presence of wind farm structures	The presence of wind farm structures in close proximity to shipping traffic may cause radar interference.	Marine radar	Minor significance	None	Minor significance	A small number of ships on the Firth of Tay route may pass within the area of radar interference; however, vessels navigating in the area are likely to be attentive to marine hazards given the proximity to the coast and nearby ports.
Physical presence of wind farm cables	Physical change in the environment due to subsea cables, resulting in a risk of hostile anchor interaction and vessel grounding.	Commercial shipping	Minor significance	Best practice Marine Control Centre monitoring vessel activity and cable route surveys (Table 17.5).	Not significant	Vessels keep clear of areas where there could be a grounding risk. Following marking on charts, anchoring practices are likely to change in the area.
	Physical change in the environment due to subsea cables resulting in a risk of fishing gear interaction (snagging).	Fishing vessels	Minor significance	Best practice Marine Control Centre monitoring vessel activity and cable route surveys (Table 17.5).	Minor significance	Areas of demersal and scallop dredging were identified. Cables should be buried/protected and fishing industry liaison carried out.
	Physical change in the environment due to subsea cables, resulting in possible electromagnetic interference on small vessels navigation equipment.	Recreation vessels	Not significant	Best practice Marine Control Centre monitoring vessel activity and cable route surveys (Table 17.5).	Not significant	Cable burial should mitigate any generated electromagnetic fields (very weak).

Table 17.6: Summary of impacts, mitigation and residual impact on shipping and navigation (construction, operation and decommissioning phases)

17.8 Cumulative and In-Combination Impacts

199 Cumulative impacts associated with shipping and navigation in the vicinity of Neart na Gaoithe (shipping, fishing, recreation and associated facilities) are assessed in the NRA (Appendix 17.1: Neart na Gaoithe Offshore Wind Farm – Navigation Risk Assessment).

200 This section presents an assessment of potential cumulative and in-combination impacts associated with Neart na Gaoithe. The cumulative assessment of Firth of Forth and Tay regional developments is carried out based on the indicative red line boundaries that are currently being used as part of ongoing assessments.

201 Developments at Neart na Gaoithe and Inch Cape sites, and the Firth of Forth Round 3 Zone 2 projects, represent a large area of offshore wind farm development in the outer Firth of Forth and Tay. Therefore, The Crown Estate formed FTOWDG to collaboratively identify potential cumulative effects of multi wind farm development.

202 A regional report was commissioned by FTOWDG (Appendix 17.6: FTOWDG Regional Shipping Review) to review the shipping and navigational aspects of the proposals on a regional level. This ensured that the individual developments are carried out in a coherent manner and cumulative issues relating to shipping and navigation are considered.

203 The FTOWDG report will be updated as consultations and assessments are undertaken on both project and cumulative levels throughout 2012. This will include the current indicative site boundaries incorporating any changes in planned capacity and final site designs.

17.8.1 Cumulative Impacts

204 The potential cumulative impacts on shipping and navigation and in-combination impacts on other developments from Neart na Gaoithe, are assessed using the impact assessment methodology in Section 17.4. The assessment assumes industry standard mitigation measures (as per MGN 371 and IALA O-139).

205 It should be noted that there may also be higher risk areas during overlapping construction and decommissioning phases of different projects within the region, associated with partially constructed turbines and cables, however these activities are generally of short duration and limited extent. It is also expected that Neart na Gaoithe will be constructed first (commencing construction in 2014), with the construction of Inch Cape and the Firth of Forth Round 3 Zone 2 Phase 1 sites planned in 2015.

206 Therefore the assessment of cumulative and in-combination impacts focuses on the operational phases of the wind farm projects in the region.

207 The indicative project boundaries were used in the Hazard Review workshop carried out in November 2011 to gain feedback from marine stakeholders on the potential cumulative impacts of the regional developments. Detailed results of the workshop can be found in Appendix 17.1: Neart na Gaoithe Offshore Wind Farm – Navigation Risk Assessment. The potential cumulative impacts associated with Neart na Gaoithe on shipping and navigation receptors are assessed in the following sections.

17.8.1.1 Commercial Shipping

208 The baseline assessment identified that two routes (both of medium sensitivity) will be required to deviate from Neart na Gaoithe. Shipping headed to Dundee and the Firth of Tay will pass to the west of Neart na Gaoithe and traffic transiting between northern Scottish ports (Aberdeen, Peterhead and the Northern Isles) and the Humber will make a minor deviation to the east of the offshore site. An average track estimated on each of the impacted routes prior to the construction of Neart na Gaoithe and the regional developments is presented in Figure 17.26.

209 Vessels deviating to the northeast of Neart na Gaoithe could be cumulatively impacted by Inch Cape and the Phase 1 development within the Firth of Forth Round 3 Zone 2 due to vessels being 'squeezed' into narrower sea areas and denser routes. There is a channel of approximately 3 to 4 NM between Inch Cape and the western edge of the Phase 1 area. Feedback from the Hazard Review workshop indicated that smaller merchant vessels and coastal tankers are likely to be operating to tight time and fuel margins and need to take the shortest routes.

210 The impact on vessels (collision risk, deviations from current tracks and impacts on marine radar) using a route deviated through this channel are likely to be moderate. Assuming ships will be able to pre-plan their revised passage in advance of encountering the regional wind farm developments, Masters should be able to navigate through this channel. An alternative coastal route could be taken west of Neart na Gaoithe and Inch Cape, dependent on the sea state and weather conditions. It was noted during the regional FTOWDG marine stakeholder feedback that the prevailing wind is from the southwest; and it is not perceived to pose any problems with vessels navigating in proximity to the wind farms. It was also stated by Marine Scotland Compliance Masters that with a northeast to southeast (onshore) wind, vessel officers are likely to make an assessment if it is considered safe to take the inshore route via Bell Rock, or to transit further east prior to turning and passing east of the wind farms.

211 When these effects were considered against the low number of vessels on the deviated route transiting between northern Scottish ports and the Humber (approximately one every three days), and assuming standard procedures are followed (Table 17.5), the impact on vessel routeing, collision risk and radar impacts was considered to be moderate. Overall, the cumulative effects on commercial shipping from Neart na Gaoithe are considered to be of ***moderate significance.***

17.8.1.2 Fishing Vessel Navigation

212 From the baseline assessment it is noted that the majority of commercial fishing traffic in the vicinity of Neart na Gaoithe is located to the southwest of the offshore site. A small number of vessels were recorded on passage through Neart na Gaoithe (north/south) and could be cumulatively impacted in terms of routeing around Inch Cape and the Phase 1 sites of the Firth of Forth Round 3 Zone 2 (increased transit distance and time).

213 The main hazard identified relates to fishing vessels exiting the wind farms into shipping routes. However, it is noted that over time the risks associated with this hazard will reduce as AIS carriage on fishing vessels becomes mandatory for smaller vessels (by 2014 all fishing vessels 15 m in length or greater, will be required to install AIS).

214 Taking into account the low number of fishing vessels recorded transiting through Neart na Gaoithe and assuming standard mitigation measures are in place, the cumulative navigational impact is considered to be of ***minor significance***.

17.8.1.3 Recreation Vessel Routeing

215 The marine traffic survey and stakeholder consultation have identified a low level of recreational activity compared to other UK sea areas.

216 As with fishing vessels, the potential impacts are likely to relate to the navigation of recreational vessels in close proximity to structures and recreational vessels being displaced into commercial shipping routes (and vice versa) to 'squeeze'. As a result of both these impacts it is expected that the main area of risk will be associated with recreational craft exiting Neart na Gaoithe in proximity to commercial shipping routes.

217 Given the low level of recreational activity recorded within and in proximity to Neart na Gaoithe and the assumption that standard mitigation measures are in place (lighting, minimum blade clearance and marking on charts), vessels will be able to navigate between the wind farm turbines in a safe manner with a minor impact on routeing. Therefore cumulative effects on recreational activities are considered to be of ***minor significance***.

17.8.2 In-Combination Impacts

218 As well as cumulative impacts from other wind farm developments within the outer Firth of Forth and Tay, possible in-combination impacts were identified during the NRA.

219 There are a number of major ports located within the Firth of Forth and Tay; therefore in-combination effects on shipping are likely to be linked to associated traffic movements rather than port functions (pilots generally board within the inner Firth of Forth, off Leith and the Forth Ports limit is 8 NM west of Neart na Gaoithe). Following a review of the Future Case traffic and collision risk, potential increases in traffic associated with new or improved port developments is likely to have a minor in-combination impact on Neart na Gaoithe as the large majority of shipping associated with ports in the region route south of the offshore site.

220 During cable laying activities there will be an increase in vessel activity within the export cable corridor which will increase risk to vessels transiting in and out of the Firth of Forth ports on medium sensitivity routes. The risk is related to increasing vessel-to-vessel encounters and potential 'squeeze', especially in emergency situations.

221 However, when these effects are considered against the limited duration of the activities and industry standard mitigation measures (including promulgation of information), the effect was considered to be negligible. Therefore, the in-combination impact on port activities and shipping and navigation from Neart na Gaoithe and offshore cable route is considered to be of ***minor significance***.

222 Consultation with Forth Ports identified that there are proposals for three biomass plants within the Firth of Forth and Tay region, which if constructed could bring in an increased number of large bulk carriers. The Environmental Statements for the proposed biomass plants (Rosyth, Grangemouth and Dundee) note that it is expected that up to 90% of the fuel deliveries could arrive by ship. No details of ports are currently available, however it is expected that there will be two deliveries per week, which will come from both international and UK sources.

223 The Future Case (with wind farm) collision risk modelling assumes increased traffic on routes passing through the area, and if there is increased traffic to Dundee from the south, vessels could route west of Neart na Gaoithe. However, given the uncertainty of predicting the international and UK delivery ports, there is insufficient information at this time to assess the impact.

224 In terms of offshore oil and gas activity, due to the distance of the nearest offshore installation (the Norpipe platform is 97 NM southeast) there are not considered to be any in-combination impacts with offshore operations. Jack-up drilling rigs can be towed through the area to Dundee when undergoing maintenance. Given restrictions in manoeuvrability, rigs under tow are likely to keep clear of the offshore site and any effects on additional routeing distance are expected to be negligible. Overall the impact on offshore operations is considered to be ***not significant***.

17.9 Monitoring

17.9.1 General Monitoring

225 A Safety Management System (SMS) will include an incident/accident reporting system which will allow incidents and near misses to be recorded and reviewed to monitor the effectiveness of the risk control measures in place at the site. In addition to the SMS, any information learned from near misses/accidents at other offshore wind farm sites will be considered with respect to the control measures applied at Neart na Gaoithe offshore wind farm.

226 The inter-array and export subsea cables will be subject to periodic inspection to ensure they remain buried. The strategy has not yet been finalised but as an indication would involve an inspection after 6 months then annually for the next 3 years. Any inspection and monitoring requirements would be discussed with the regulator prior to construction.

17.9.2 Vessel Monitoring

227 A Marine Control Centre monitoring AIS could be used to monitor and record the movements of vessels around the wind farm (work boats and passing vessels). It was noted, during the shipping and navigation Hazard Workshop, that Forth Ports has VTS coverage in the area of Neart na Gaoithe.

228 In addition, vessel activity may be monitored by CCTV covering the whole Neart na Gaoithe wind farm from key locations either on the wind turbine structures or the substations. CCTV technology can be adjustable for day/night conditions, which will allow operators in a central control room to identify vessel names to facilitate radio communications. The distance at which vessels could be identified on CCTV will depend on the vessel size, weather conditions and the number, location and height of CCTV systems.

229 There will also be vessels regularly operating in the site, including during planned and unplanned maintenance, which can monitor any third party vessel activity both visually and on radar, although this will not be their primary function.

17.10 Summary and Conclusions

230 Consultation with navigational stakeholders was positive; however, continued coordination of activities with the other FTOWDG developers should be carried out. Consultation is ongoing to ensure navigation and non-navigational issues are addressed during different stages of the wind farm development.

231 Following the hazard review workshop involving local navigational stakeholders and identification of the key navigational hazards, risk analyses were carried out to investigate selected hazards in more detail. The overall level of risk post development including industry standard mitigation measures was found to be low, with the highest collision risk from fishing vessel to wind farm structure collision. The fishing vessel collision frequency assumes the maximum target area for all the structures in the indicative layouts and also that fishing vessel density following wind farm construction will remain the same (current levels).

232 In terms of fishing vessel navigation, there is good prospect for fishing vessels to navigate within the wind farm. However, dependent on sea and weather conditions fishing vessels may need to deviate around the offshore site. Overall, taking into account the impact on fishing vessel routeing and the results of modelling the ship-to-wind farm structure collisions, the navigational impact on fishing vessels from Neart na Gaoithe is considered to be of ***moderate significance***.

233 There are two main medium sensitivity ship routes passing in close proximity to the offshore site which will deviate from current routes. There is available sea room east and west of Neart na Gaoithe for vessels to increase passing distance, however the routes are also expected to narrow slightly leading to an increase in vessel-to-vessel collision risk. Overall, taking into account the impact of vessels revising routeing around Neart na Gaoithe and the results of modelling the ship-to-ship collisions and ship-to-wind farm structure collisions, the impact on commercial shipping from Neart na Gaoithe is considered to be of ***moderate significance***.

234 The air clearance between turbine rotors and sea level conditions at MHWS will not be less than 22 m, minimising the risk of interaction between rotor blades and yacht masts. In terms of vessel routeing, increased transit times and collision risk, there is one medium use cruising route passing through Neart na Gaoithe. Vessels should be able to pass between turbines in suitable conditions (i.e., during good visibility and calm sea conditions), however it is not expected to be a frequent event and, assuming industry standard mitigation, the overall impact is considered to be of ***minor significance***.

235 An impact of ***minor significance*** was predicted on shipping and navigation anchoring practices and risk of an anchor dragging over the export cable route, assuming industry standard management procedures and mitigation.

236 Local fishing vessels will be aware of construction works and cable laying vessels within the export cable corridor through NtMs and fisheries liaison. There is a risk to fishing vessels should they snag their gear on unprotected cables or cables running over spans. However, with cable protection and liaison with the fishing industry, the risk of snagging gear is likely to be a minor impact. Overall, it is considered that export cables from Neart na Gaoithe will result in a navigational impact of ***minor significance*** to fishing vessels.

237 Recreation activity was recorded based on cruising routes and AIS data; however, given the available sea room and temporary nature of cable laying works, a negligible impact is predicted on recreation vessel routeing and collision risk The export cables will be buried/protected, and any electromagnetic fields will be very weak, resulting in a negligible impact on marine navigation equipment

238 Cumulative issues were assessed as part of the regional FTOWDG remit. In terms of the cumulative impacts associated with Neart na Gaoithe using the regional indicative site boundaries, a number of vessels deviating east of Neart na Gaoithe on a medium sensitivity route could be cumulatively impacted by Inch Cape and the Phase 1 sites in the Firth of Forth Round 3 Zone. Vessels could be 'squeezed' into narrower sea areas and denser routes in a channel of approximately 3 to 4 NM. In addition, vessels on this route are likely to experience moderate levels of radar interference. Overall, given the increased collision risk and route deviations, the cumulative effects on vessels passing east of the offshore site are considered to be of ***moderate significance***.

239 For fishing and recreational vessels the main cumulative impact relates to smaller vessels being displaced into commercial shipping routes (and vice versa) to 'squeeze'. Given the low level of fishing vessel transits and recreational activity recorded within the area and the assumption that standard mitigation measures are in place, vessels will be able to navigate between the wind farm turbines in a safe manner. Therefore cumulative effects on fishing and recreation vessels are considered to be of ***minor significance***.

240 Following a review of the Future Case traffic and collision risk, potential increases in traffic associated with new or improved port developments are likely to have a minor in-combination impact on Neart na Gaoithe as the large majority of shipping associated with ports in the region route south of the offshore site.

241 In terms of offshore oil and gas activity given the distance of the nearest offshore installation there are not considered to be any in-combination impacts on offshore operations from Neart na Gaoithe.

242 In-combination impacts could arise with construction of three biomass plants within the Firth of Forth and Tay region, which could bring in an increased number of large bulk carriers. However, given the uncertainty of predicting where vessels will route to/from, there is insufficient information at this time to assess the impact.

243 A summary of the overall impact on shipping and navigation from Neart na Gaoithe is presented in Table 17.7.

Source	Pathway	Receptor	Significance (assuming industry standard mitigation)	Mitigation	Significance post-mitigation	Cumulative / in-combination impact significance	Explanatory notes
Physical presence of wind farm structures	Physical change in the environment due to wind farm structures leading to a loss of navigable sea room and deviations around structures which may lead to increased collision risk (vessel-to-vessel and vessel-to-structure).	Commercial shipping	Moderate significance	Best practice Marine Control Centre monitoring vessel activity and safety zones/guard vessels.	Minor significance	Moderate significance	Vessels should be able to pre-plan their voyage and based on analysis of shipping data there is available sea room east and west of the site for shipping to increase passing distance from wind farm structures.
	Physical change in the environment due to wind farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Fishing vessels	Moderate significance	Best practice, including a Marine Control Centre monitoring fishing vessels and safety zones/guard vessels.	Minor significance	Minor significance	Fishing vessels should be aware of the wind farm through liaison and consultation. Impacts on fishing vessels steaming passed the site are similar to other passing vessels. However, there are good prospects for fishing vessels to navigate within the wind farm.
	Physical change in the environment due to wind farm structures leading to a loss of navigable sea room and deviations around structures resulting in an increased collision risk (vessel-to-vessel and vessel-to-structure).	Recreation vessels	Minor significance	Best practice, including a Marine Control Centre monitoring vessel activity and safety zones/guard vessels.	Minor significance	Minor significance	Recreation vessels should be able to pass between turbines in suitable conditions, as well as being able to pass inshore and offshore of the wind farm. Based on the recreational activity it is not expected to be a frequent event.
Physical presence of wind farm structures and subsea cables	The presence of structures, subsea cabling and increased levels of operation/maintenance vessels may lead to an increased number of SAR incidents. In addition, passing vessels will deviate around structures which may lead to increased collision risk (vessel-to-vessel and vessel-to-structure).	SAR resources	Minor significance	Best practice, including a Marine Control Centre monitoring vessel activity and safety zones/guard vessels.	Minor significance	Not significant	Historical incident levels in the vicinity of Neart na Gaoithe and associated export cable route have tended to be low and it is considered unlikely that the development will exacerbate maritime safety risks in the area.
Physical presence of wind farm structures	The presence of wind farm structures in close proximity to shipping traffic may cause radar interference.	Marine radar	Minor significance	None	n/a	Moderate significance	A small number of ships on the Firth of Tay route may pass within the area of radar interference; however vessels navigating in the area are likely to be attentive to marine hazards given the proximity to the coast and nearby ports.
Physical presence of wind farm cables	Physical change in the environment due to subsea cables, resulting in a risk of hostile anchor interaction and vessel grounding.	Commercial shipping	Minor significance	Best practice, including a Marine Control Centre monitoring vessel activity and cable route surveys.	Minor significance	Minor significance	Vessels keep clear of areas where there could be a grounding risk. Following marking on charts, anchoring practices are likely to change in the area.
	Physical change in the environment due to subsea cables resulting in a risk of fishing gear interaction (snagging).	Fishing vessels	Minor significance	Best practice, including a Marine Control Centre monitoring vessel activity and cable route surveys.	Minor significance	Minor significance	Areas of demersal and scallop dredging were identified. Cables should be buried/protected and fishing industry liaison carried out.
	Physical change in the environment due to subsea cables, resulting in possible electromagnetic interference on small vessels navigation equipment.	Recreation vessels	Not significant	Best practice, including a Marine Control Centre monitoring vessel activity and cable route surveys.	Not significant	Not significant	Cable burial should mitigate any generated electromagnetic fields and any interference is likely to be very weak.

Table 17.7: Shipping and navigation summary significance table (receptor specific)

17.11 References

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Appendices

Appendix 17.1: Neart na Gaoithe Offshore Wind Farm - Navigation Risk Assessment

Appendix 17.2: Hazard Log Review Report

Appendix 17.3: Consequences Assessment Report

Appendix 17.4: Neart na Gaoithe Offshore Wind Farm MGN 371 Checklist

Appendix 17.5: Hazard Log Review Minutes

Appendix 17.6: FTOWDG Regional Shipping Review