CHAPTER 15: SHIPPING AND NAVIGATION

Technical Summary

In support of the shipping and navigation assessment a Navigational Risk Assessment was undertaken. This involved the collection of data on use of the area by shipping, a hazard identification workshop and shipping operator consultation.

Shipping activity was recorded using vessel Automatic Identification System transmission. Radar track data was also recorded for a summer and winter period from two site specific, vessel based surveys.

Risk to vessels associated with collision are predicted to increase as a result of construction related activities; however with temporary closures and exclusions zones the risk is assessed as being acceptable and not significant. Although some significant risks were predicted during the operational phase, most of these relate to an indicative worst case shipping and navigation layout plan in which a gap was left between the Project Alpha and Project Bravo layouts. After the application of appropriate mitigation, including of vessel tracking, warning notices, publication of locational data on charts, no significant residual risks are predicted.

INTRODUCTION

15.1. This Environmental Statement (ES) chapter summarises the work undertaken by Anatec Limited (Anatec) as part of the Navigational Risk Assessment (NRA) and its subsequent assessment within the Environmental Impact Assessment (EIA).

15.2. The NRA identifies the baseline vessel activity and navigational features in the vicinity of the Seagreen Project. The Seagreen Project comprises Project Alpha, Project Bravo and the Transmission Asset Project which connects Project Alpha and Project Bravo via the Export Cable Route (ECR) corridor to land, on the east coast of Scotland at Carnoustie. Further details on the Seagreen Project can be found in Chapter 5: Project Description of this ES.

15.3. In carrying out the assessment, shipping survey data, recreational sailing data, maritime incident data and fishing satellite surveillance data presented as density plots were used to identify the baseline navigational activity relative to the Seagreen Project. This was gathered through baseline surveys, literature review and consultation.

15.4. The following chapter presents the findings of the shipping and navigational assessment and should be read in conjunction with the NRA Report in Appendix J1 and the Forth and Tay Offshore Wind Developers Group (FTOWDG) Regional Shipping and Navigation Report in Appendix J2, which can be found in ES Volume III: Appendices. All figures referred to in this chapter can be found in ES Volume II: Figures.

CONSULTATION

15.5. Key marine and navigational stakeholders were consulted as part of the NRA and the EIA. The following stakeholders were consulted:

- Maritime and Coastguard Agency (MCA)*;
- Northern Lighthouse Board (NLB)*;
- Royal National Lifeboat Institute (RNLI);
- The Chamber of Shipping (CoS);
- Department for Transport (DfT);

- Royal Yachting Association (RYA)*;
- Fife Council Development Services;
- Forth Estuary Forum;
- Forth Ports*;
- Marine Scotland*;
- Kingdom Seafood/ FMA Ltd*;
- Anglo-Scottish Fisherman's Federation*; and
- Scottish Fisherman's Federation (SFF)*.

15.6. A hazard identification workshop was carried out in January 2012 as part of the NRA process. The workshop involved key marine and navigational stakeholders (marked in the above list by *). During the workshop the key maritime hazards associated with the Seagreen Project were identified, along with associated scenarios prioritised by risk level. Note that indicative offshore wind farm (OWF) layouts were not presented at the hazard workshop so it was assumed at the workshop that infrastructure could be located anywhere within the Project Alpha and Project Bravo Sites.

15.7. Table 15.1 summarises the issues raised during consultation with the key stakeholders.

Table 15.1 Summary of Consultation and Issues

Date	Consultee	Issue	Relevant chapter paragraph
Scoping Response	Fife Council Development Services	The impact on the Port of Rosyth should be assessed in terms of possible future development of European shipping routes.	Appendix J1: NRA
Scoping Response	Forth Estuary Forum	The Forth Estuary Forums stated that they would like to see high quality, temporally sensitive navigational data to be collected, rather than an average over several years of existing data.	Paragraphs 15.9 – 15.34 and Appendix J1: NRA
Scoping Response	Forth Ports	Forth Ports noted that they will be interested in obtaining the results of the navigation study and are more than willing to assist studies. Forth Ports are fully supportive of the OWF development and are available to contribute to the planning and construction process both from a navigation point of view and the utilisation of port facilities.	n/ a
Scoping Response	Marine Scotland	The NRA should be carried out according to Marine Guidance Note (MGN) 371.	Appendix J1: NRA
Scoping Response	MCA	The NRA should be submitted in accordance with MGN 371 (and 372) and the DfT/ MCA Methodology for Assessing the Marine Navigational Safety Risks of OWFs.	Appendix J1: NRA
		Particular attention should be paid to cabling routes and burial depth and, subject to the traffic volumes, an anchor penetration study may be necessary.	Appendix J1: NRA and Export Cable Route NRA

Date	Consultee	Issue	Relevant chapter paragraph
		Radar effects of OWFs on ship's radars are an important issue and subject to further discussion within the radar sub group of *Nautical Offshore Renewable Energy Liaison (*NOREL). The radar effects will need to be assessed on a site specific basis.	Paragraphs 15.195 – 15.199, 15.251 – 15.252 and Appendix J1: NRA
Scoping Response	NLB	As part of the formal application, the NLB would require that a full NRA is undertaken. NLB assumes that any formal recommendations for lighting and marking will be given through the Coast Protection Act 1949 – Section 34 process.	Appendix J1: NRA
Scoping Response	RNLI	The RNLI raised concern over increased potential for casualties due to the impacts on the major shipping routes and more particularly on those areas visited by the commercial fishing industry.	Paragraphs 15.189 – 15.194 and Appendix J1: NRA
Scoping Response	RYA	The RYA would expect that recreational boating should be considered under Shipping and Navigation (including the NRA) as well as in Tourism and Recreation.	Appendix J1: NRA and Chapter 19: Socio-economics and Tourism
January 2011	CoS	For shipping passing through the Firth of Forth Zone north/ south from Aberdeen to north east England, the current alternative route scenario (vessels will pass east of all of the developments) is worthy of consideration, however it limits ships to 'non-sheltered waters', providing them with no inshore route for over 30 miles (assuming the entire Zone is developed). Dialogue with vessel operators and seasonal AIS data could provide some information about current navigation strategies in extreme weather circumstances.	Appendix J1: NRA
		For shipping passing through Inch Cape and the Firth of Forth Zone from Montrose to Holland, there are merging traffic issues (tankers and cargo affected). If vessels pass west of developments/ inshore, then this increases the density of shipping along an existing shipping route east and west of Bell Rock. Should also consider alternative route between Inch Cape and Neart na Gaoithe.	Appendix J1: NRA
January 2011	Forth Ports	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.	Appendix J1: NRA

Date	Consultee	Issue	Relevant chapter paragraph
January 2011	MCA and DfT	It was emphasized that the assessment must consider what hazards are created by the suggested route changes and that reference is made to potential impacts of Wind Turbine Generators (WTGs) on radar and how this is impacted on the route changes.	Paragraphs 15.195 – 15.199, 15.251 – 15.252 and Appendix J1: NRA
August 2011	MCA	Radar survey data collected in summer 2011 accepted by MCA on 16/ 08/ 11(by email) in accordance with MGN 371 Annex ,1 paragraph 2	Paragraphs 15.15 - 15.19

15.8. Shipping operators were identified and contacted for feedback on the impact of the Seagreen Project. A summary of the main feedback received is presented in Table 15.2 below.

Table 15.2 Summary of Shipping Operator Consultation

Shipping Operator	Summary of Response
Solstad (offshore vessels)	The regional developments will not affect their operations. In general, port callings are to Aberdeen or Peterhead. If vessels pass through the region following construction of OWFs, Solstad indicated that they would not have any problems navigating through the OWFs.
Transmarine Management ApS (tankers bound for Dundee)	Initial findings are that when Transmarine Management ApS ships are bound to Dundee (in-ward) the developments are not a problem, but when leaving Dundee for direction Skaw (Skagen), Denmark they will require re-routing.
SAGA Cruises (cruise vessels)	In general the proposals do not pose a safety risk to SAGA Cruise vessels.
Fred Olsen Cruises (cruise vessels)	Fred Olsen Cruises transit the area, especially during the summer months, however they have no concerns regarding the impact on operations.
James Fisher Everard (coastal tankers bound for Forth, Tay and Northern Ports)	No comments were supplied.
Armac Marine Management Ltd (cargo vessels bound for Montrose)	Some routes will be affected but provided that the constructions are adequately marked and correctly charted, Armac Marine Management Ltd does not have any concerns regarding safe navigation, (the opinion of several Masters in the company).

ASSESSMENT METHODOLOGY

Regulations and Guidance

15.9. The methodology used to assess the impacts of the Seagreen Project, principally follows the Department of Energy and Climate Change (DECC) Risk Assessment Methodology (DECC, 2005) and the MCA Marine Guidance Note (MGN) 371 (M+F) (MCA, 2008).

15.10. DECC, in association with the MCA and DfT, produced the *Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms* (DECC, 2005), to provide a template for developers in preparing their navigation risk assessments. The methodology is centred on risk controls/ mitigation measures and how they influence the outcome of the risk assessment. It requires a submission that shows sufficient mitigation measures are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with further controls or actions.

15.11. The MCA's MGN 371 highlights issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments in the United Kingdom (UK). It also recommends safety and mitigation measures, including procedures in the event of a search and rescue (SAR), counter pollution or salvage incident in or around an OWF.

Study Area

15.12. This shipping and navigation chapter focuses on different spatial scales of study area which are described in more detail below[1]:

- the Immediate Study Area (ISA) is a 10 nautical mile (NM) buffer[2] around the Seagreen Phase 1 area (Figure 15.1);
- for the Transmission Asset Project, the ISA is defined as a 10NM buffer[3] around the ECR corridor (Figure 15.2);
- the Regional Study Area (RSA) is the outer Firth of Forth and Tay region, which encompasses the Zone and the Scottish Territorial Waters (STW) sites in proximity to the Seagreen Project (Inch Cape and Neart na Gaoithe); and
- the Wider Study Area (WSA) is the Northern North Sea.

Data Collection and Survey

15.13. This section summarises the main data sources used in characterising the baseline environment relative to the Seagreen Project. The main data sources used in this assessment are listed in Table 15.3 and discussed in detail in the following sub-sections.

15.14. Other data sources and reference materials used in the baseline assessment are listed below:

- UK Admiralty Charts:
  - Chart 1407 (Montrose to Berwick-upon-Tweed);
  - Chart 1409 (Buckie to Arbroath);
  - Chart 2182B (North Sea Central Chart); and
- Admiralty Sailing Directions (NP 54) (UKHO, 2009).

1 Note that marine traffic surveys were undertaken prior to the delineation of the separate wind farms (Project Alpha and Project Bravo) and covered an area originally referred to as the Seagreen Phase 1 area encompassing Project Alpha and Project Bravo.

2 1 nautical mile = 1.852 kilometres

3 Note that the boundary of the Transmission Asset Project changed within the process of carrying out the work but the ISA still extends a minimum of 8NM around the entire project which is considered sufficient.

Table 15.3 Summary of Key Data and Surveys

Title	Source	Year	Reference
Vessel *EEMS* Automatic Identification System (AIS) and radar survey data	*EEMS* Shipping Survey	2011	Anatec Ltd, *Maritime Traffic Survey (March 2011)* Rev01. A2520- SG-TS-1, 17 May 11.
Vessel *Highland Eagle* AIS and radar survey data	*Highland Eagle* Shipping Survey	2011	Anatec Ltd, *Maritime Traffic Survey* (July 2011) Rev01. A2520- SG-TS-1, 5 September 11.
Forth and Tay Offshore Wind Developers Group (FTOWDG) AIS data, June and November 2010	FTOWDG	2010	As presented in the Anatec Ltd (2011). FTOWDG Regional Shipping and Navigation Report (Appendix J2 of ES Volume III).
Fishing satellite surveillance data (2009)	Marine Management Organisation (MMO)	2009	MMO
Marine Accident Investigation Branch (MAIB) (2001-2010)	MAIB	2001-10	MAIB
RNLI (2001-10)	RNLI	2001-10	RNLI
RYA Atlas of cruising routes and racing areas	RYA	2008 – (Updated 2010)	RYA (2008), *UK Sailing Coastal Atlas*. (Updated 2010).

Shipping Survey Data

15.15. Baseline shipping activity was assessed using Automatic Identification System (AIS) and radar track data recorded for a 40 day period from two site specific vessel based surveys (EEMS March 2011 and MV Highland Eagle June/ July 2011). These vessels are pictured below in Plate 15.1 and Plate 15.2. The period of data collection encompassed summer and winter data to give account to the changes in shipping due to tides and seasonality, i.e. mainly changes in recreation and fishing activity. See Figure 15.3 in ES Volume II for survey vessel tracks recorded during the 40 day survey period.

15.16. In total 14 days data were collected from EEMS during the winter survey and 26 days of data were recorded from Highland Eagle during the summer survey, meeting the objective to identify vessel activity both within and adjacent to the Seagreen Project including seasonal variations for a minimum of 28 days as per MCA guidance (MGN 371) (MCA, 2008).

15.17. AIS is required to be fitted aboard all ships engaged on international voyages of 300 gross tonnage (GT) and upwards, cargo ships of 500 GT and upwards not engaged on international voyages and passenger ships (carrying 12 or more passengers), irrespective of size, built on or after 1st July 2002. At the time of undertaking the surveys, fishing vessels of 45 metres (m) length and over were required to carry AIS under European Union (EU) Directive. This changed to 24m and above from 31 May 2012 and by 31 May 2014 will apply to all fishing vessels of 15m length and over.

Plate 15.1 Survey Vessel *EEMS*

Plate 15.2 Survey Vessel *Highland Eagle*

15.18. Non-AIS vessels were also recorded during the EEMS and Highland Eagle surveys from an Automatic Radar Plotting Aid (ARPA). These radar track data were supplemented by manual observations of vessels within visual range to obtain information on type and size, where the information was not available from AIS. Non-AIS vessels tended to be smaller craft, i.e. recreation and fishing vessels (under 45m).

15.19. It is noted that the radar tracking range is approximately 12NM from the centre of the Phase 1 area and also that the AIS tracking range is likely to be at the limit of coverage to the south of Bell Rock.

Long Term Coastal Survey Data

15.20. In addition, AIS shipping data were collected from coastal AIS surveying by FTOWDG during two 28 day periods in 2010 encompassing seasonal fluctuations from summer (June) and winter (November). These coastal-based AIS data were used to validate the findings of surveys carried out during 2011 and were collected from coastal sites located at Stonehaven, Dundee, Inner Forth and Dunbar.

Fishing Data

15.21. Fishing vessel data are presented from the AIS and radar track data recorded during the Phase 1 shipping surveys (March 2011 and June/ July 2011). In addition, fishing vessel satellite monitoring data from 2009 were obtained from the MMO and converted to fishing vessel density plots to validate the survey data presented in the baseline assessment and identify gear types used.

Maritime Incident Data

15.22. Maritime incident data for the ISA have been analysed from two sources to assess the level of historical incidents recorded within 10NM of the Seagreen Project. The MAIB and RNLI maintain databases of the location of accidents, injuries and hazardous incidents and these have been imported into Geographic Information System (GIS) for mapping and analysis.

15.23. All UK commercial vessels are required to report accidents to MAIB. Non-UK vessels do not have to report unless they are in a UK port or are in 12 mile territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report accidents to MAIB. The MAIB aim for 97% accuracy in reporting the locations of incidents.

Recreation Data

15.24. The RYA Cruising Atlas identified recreational cruising routes, general sailing areas and general racing areas around UK waters (RYA, 2008). This work was based on extensive consultation and qualitative data collection from RYA and Cruising Association (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 GIS layers from 2010 have been used in this assessment.

Charts and Sailing Directions

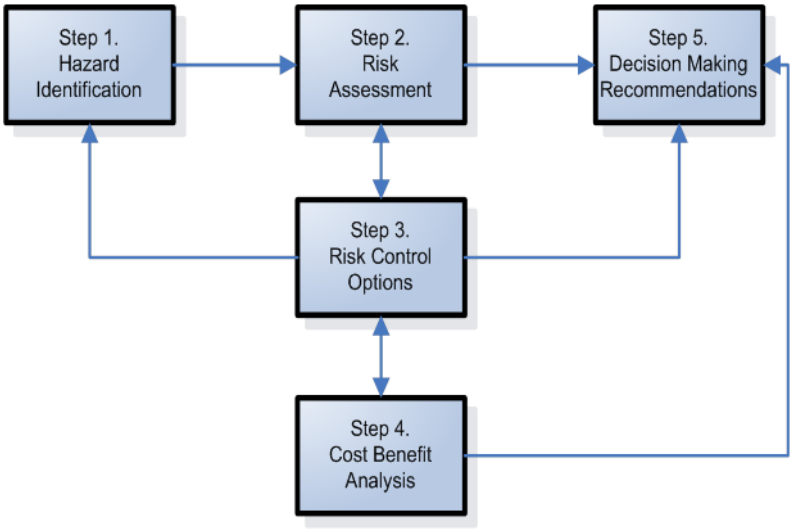
15.25. UK admiralty charts and sailing directions for the RSA have been used to consider port approaches and entrances to harbours in the RSA and identify navigational features.

Impact Assessment Methodology

15.26. The baseline assessment, which had inputs from the maritime traffic survey, desk-based research and consultation, allowed the higher risk areas to be identified.

15.27. Following this, a Formal Safety Assessment (FSA) was carried out in-line with the International Maritime Organisation (IMO) FSA process (IMO, 2007) and DECC guidance (DECC, 2005) to assess the impact of the Seagreen Project on shipping and navigation (as illustrated in Plate 15.3 below).

Plate 15.3 FSA Process



15.28. The risk assessment within the impacts section (from Impact Assessment-Operation onwards) includes the following:

- a quantified navigational risk assessment for selected hazards;
- base case and future case risk levels assessed for selected hazards;
- maritime incident and SAR review; and
- assessment of mitigation measures.

15.29. All the quantified risk assessments undertaken in the NRA were carried out using Anatec's COLLRISK software which conforms to the DECC methodology as outlined in Annex D3 in the Guidance (DECC, 2005). The NRA (Appendix J1) contains a detailed explanation of the collision risk models.

15.30. The main part of the assessment covers the potential impacts on shipping and navigation in relation to commercial, recreation and fishing vessels during the construction, operation and decommissioning phases of the development. Impacts on Search and Rescue and marine radar were assessed for the operational phase of the development only due to no additional impacts being present during the construction and decommissioning phases.

15.31. Due to the nature of the impacts for shipping and navigation, it is not considered appropriate to apply sensitivity and magnitude to receptors and impacts, respectively.

15.32. The significance of impacts has instead been assessed using expert information and results of analysis carried out as part of the NRA which followed the previously described FSA approach. The following significance terminology has been used:

15.33. **Not Significant**: Impacts which are slight in terms of vessel routing (minor deviations around the OWF) and low risk in terms of vessel navigation, collision risk and response to marine incidents.

15.34. **Significant:** Impacts which are moderate in terms of vessel routing (larger deviations around the OWF) and high risk in terms of vessel navigation, collision risk and response to marine incidents.

EXISTING ENVIRONMENT

15.35. This section presents a description of the existing environment for Project Alpha, Project Bravo and the Transmission Asset Project and establishes a baseline from which the impact assessment can be made.

Project Alpha

Navigational Features

15.36. Figure 15.4 presents the main navigational features relative to the Project Alpha Site. The main navigational aid/ feature in the area is the Racon (RAdar beaCON transmitting Morse 'M') located on Bell Rock 15.5NM west south west of the Project Alpha site. In addition, the Montrose Pilotage Station is located 16NM west of the Project Alpha Site, on the approach to Montrose.

Marine Traffic Surveys

Shipping Surveys (2011)

15.37. Figure 15.5 presents the AIS and radar shipping tracks recorded during the combined 40 day survey period in March 2011 and June/ July 2011 in the ISA.

15.38. The majority of shipping passing through Project Alpha is headed in a north-south direction. Vessels are mainly composed of tankers headed between northern Scottish ports including Aberdeen and Peterhead and eastern UK ports including Immingham on the River Humber.

15.39. In addition, small to medium sized general cargo vessels were recorded passing through Project Alpha in an east-west direction on passage between the River Tay (Dundee and Perth) and Northern Europe/ Scandinavia.

15.40. An average of 4 to 5 unique vessels were recorded intersecting the Project Alpha Site per day during the 40 day survey period. The majority of tracks were recorded on AIS (91%), with a minority of non-AIS vessels recorded on radar (9%).

Coastal Survey Data (2010)

15.41. The coastal shipping data collected within the ISA as part of FTOWDG are presented in Figures 15.6 (28 days in June 2010) and 15.7 (28 days in November 2010).

15.42. An average of 4 to 5 unique vessels intersected the Project Alpha Site per day during the 28 day June 2010 survey period with an average of 4 to 5 unique vessels also being recorded per day in the 28 day November 2010 survey period.

Comparison of Survey Data

15.43. When comparing the EEMS/ Highland Eagle survey data and the coastal data, it was observed that the AIS tracks made by tanker and cargo vessels remained generally constant on the main routes intersecting the Project Alpha Site.

15.44. The average number of unique vessels recorded intersecting Project Alpha per day were the same in the EEMS/ Highland Eagle survey data and the coastal data.

Fishing Vessel Activity

15.45. This section presents fishing vessel tracks recorded during the combined 40 days of AIS and radar surveying (2011) and an analysis of the satellite surveillance data (2009).

15.46. Figure 15.8 presents the fishing activity recorded during the shipping surveys (2011) with a large proportion of these being recorded on radar rather than AIS. The majority of fishing vessel tracks in the ISA were within the Project Alpha site or to the west of the Project Alpha Site.

15.47. Fishing satellite surveillance data (2009) have been converted to fishing vessel density plots and are presented in Figure 15.9. These data show the majority of fishing activity in the ISA taking place to the west of the Project Alpha Site with a low density of activity within the Project Alpha Site relative to levels in the area.

15.48. Analysis of vessel speeds has identified that fishing vessels in the ISA were largely engaged in fishing (this is assumed for vessels recorded at speeds of 5 knots or less). In terms of gear type used by fishing vessels in the ISA, many were unspecified. Of those which were specified, scallop dredgers and stern trawlers (including demersal stern trawlers) were amongst the common gear types identified. The vast majority of fishing vessels were UK-registered (99%) with a small proportion of vessels from The Netherlands, France, Denmark and The Faroe Islands also being recorded.

15.49. Further information on commercial fishing can be found in Chapter 14: Commercial Fisheries of this ES.

Recreational Vessel Activity

15.50. Figure 15.10 presents the recreation data recorded within the ISA during the Highland Eagle shipping survey. It is noted that no recreational vessels were recorded during the EEMS winter AIS and radar survey.

15.51. In total there were six recreational vessel tracks intersecting the Project Alpha Site during the 26 days summer survey period. These vessels were recorded passing through the Project Alpha Site in a north-south direction and were likely to be headed to/ from Northern Scottish marinas including Peterhead.

15.52. The latest recreational activity and routing (2010) updated by the RYA following the publication of the UK Coastal Atlas (RYA, 2008) is presented in Figure 15.11.

15.53. Based on the RYA data, the Project Alpha Site is intersected by two medium use [4]cruising routes headed between north eastern Scotland (Peterhead) and north eastern England. In terms of facilities the nearest club is located at Montrose approximately 18NM west of the Project Alpha Site. Project Alpha is located outside of the general sailing and racing areas identified by the RYA in this area, which are to the west, closer to shore.

4 Popular routes on which some recreational craft will be seen at most times during summer daylight hours.

Maritime Incidents

15.54. This section reviews maritime incidents that have occurred within the ISA over the last 10 years. The analysis is intended to provide a general indication as to whether the ISA is currently a low or high risk area in terms of maritime incidents.

MAIB Incident Data

15.55. Figure 15.12 presents the MAIB incidents recorded from January 2001 to December 2010 within the ISA.

15.56. A total of five unique incidents involving six vessels were recorded within the ISA over the ten year period analysed, corresponding to an average of one incident every two years.

15.57. No incidents were recorded within the Project Alpha Site. The closest incident occurred approximately 5NM to the north (56° 46' N, 001° 40' W) in January 2010 when a container ship had a machinery failure in rough sea conditions.

RNLI Incident Data

15.58. Figure 15.13 presents the RNLI incidents recorded from January 2001 to December 2010 within the ISA.

15.59. A total of nine incidents were recorded within the ISA over the ten years analysed, corresponding to an average of just under one incident per year.

15.60. No incidents were recorded in the Project Alpha Site. The closest incident occurred 4.2NMm to the west of the Project Alpha Site in April 2010 when a large power boat was given assistance by Montrose All Weather Lifeboat (ALB). It is noted that no cause was given for the incident and wind force was reported at Beaufort 1. All incidents responded to by the RNLI took place inshore of the Project Alpha Site.

Search and Rescue (SAR)

15.61. This section summarises the existing SAR resources in the region.

SAR Helicopters

15.62. From Figure 15.14 it can be seen that the closest SAR helicopter base to the Seagreen Project is located at Boulmer, 66NM to the south of the Project Alpha Site. This base is operated by the RAF and has Sea King helicopters with a maximum endurance of six hours and speed of 110 miles per hour (mph), giving a potential radius of action of approximately 250NM, which is well within the range of the Project Alpha Site.

RNLI Lifeboats

15.63. The RNLI maintains a fleet of over 400 lifeboats of various types at 235 stations around the coast of the UK and Ireland. The RNLI stations in the vicinity of the Seagreen Project are presented in Figure 15.15.

15.64. At each of these stations, crew and lifeboats are available on a 24-hour basis throughout the year. Based on the location of the Project Alpha Site it is likely that ALBs from Arbroath or Montrose would respond to an incident. This is confirmed when reviewing the historical incident data.

Project Bravo

Navigational Features

15.65. Figure 15.4 presents the main navigational features relative to the Project Bravo Site. The Racon located on Bell Rock is 17.2NM west south west of the Project Bravo Site and the Montrose Pilotage Station is 21NM to the west.

Marine Traffic Surveys

Shipping Surveys (2011)

15.66. Figure 15.5 presents the AIS and radar shipping tracks recorded during the 40 day survey period in March 2011 and June/ July 2011 in the ISA.

15.67. As was the case in the Project Alpha Site, the majority of shipping passing through the Project Bravo Site is headed in a north-south direction and mainly comprised tankers and cargo vessels heading between northern Scottish ports such as Aberdeen, Dundee, Inverness and Peterhead, and eastern UK ports such as Immingham.

15.68. An additional north-south route passes through the east of the Project Bravo Site which does not intersect the Project Alpha Site. This is an alternative route used by tankers and cargo vessels to the one described above.

15.69. Small to medium sized general cargo vessels were recorded passing through the Project Bravo Site in an east-west direction on passage between the River Tay (Dundee and Perth) and Northern Europe/ Scandinavia.

15.70. An average of 5 to 6 unique vessels were recorded intersecting the Project Bravo Site per day during the 40 day survey period. The majority of tracks were recorded on AIS (92%) as opposed to non-AIS radar tracks (8%).

Coastal Survey Data (2010)

15.71. The coastal shipping data collected within the ISA as part of FTOWDG are presented in Figures 15.6 (28 days in June 2010) and 15.7 (28 days in November 2010).

15.72. An average of 4 to 5 unique vessels intersected the Project Bravo Site per day during the 28 day June 2010 survey period with an average of 4 unique vessels being recorded per day in the 28 day November 2010 survey period.

Comparison of Survey Data

15.73. As was the case for the Project Alpha Site, there was a good consistency between the EEMS/ Highland Eagle survey data and the coastal data collected for the Project Bravo Site in terms of the main routes identified and the average daily vessel numbers.

Fishing Vessel Activity

15.74. Figure 15.8 presents the fishing activity recorded during the shipping surveys (2011). It can be seen that the majority of fishing vessels in the Project Bravo Site were transiting through the site in a north-south direction.

15.75. Fishing satellite surveillance data (2009) have been converted to fishing vessel density plots and are presented in Figure 15.9. These data show the majority of fishing activity in the ISA taking place approximately 10NM west of the Project Bravo Site with a low density of activity within the Project Bravo Site relative to levels in the area.

Recreational Vessel Activity

15.76. Figure 15.10 presents the recreational vessel track data recorded within the ISA during the Highland Eagle shipping survey. It is noted that no recreational vessels were recorded during the EEMS winter AIS and radar survey.

15.77. In total there were three recreational vessel tracks intersecting the Project Bravo Site during the summer survey period. These vessels were recorded passing through the Project Bravo Site in a north-south direction and were likely to be headed to/ from Northern Scottish marinas including Peterhead and Inverness.

15.78. From the RYA data presented in Figure 15.11 it can be seen that the Project Bravo Site is intersected by one medium use cruising route headed between north eastern Scotland (Peterhead) and north eastern England. In terms of facilities, the nearest club and marina are located at Montrose and Arbroath approximately 22.6NM and 23.2NM west of the Project Bravo Site respectively.

Maritime Incidents

MAIB Incident Data

15.79. Figure 15.12 presents the MAIB incidents recorded from January 2001 to December 2010 within the ISA.

15.80. No incidents were recorded within the Project Bravo Site. The closest incident was 8NM to the north of the Project Bravo Site and has been described in detail for the Project Alpha Site.

RNLI Incident Data

15.81. Figure 15.13 presents the RNLI incidents recorded from January 2001 to December 2010 within the ISA.

15.82. No incidents were recorded within the Project Bravo Site. The closest incident is the same as that described above for the Project Alpha Site.

Search and Rescue (SAR)

SAR Helicopters

15.83. The SAR helicopter base at RAF Boulmer, as described for the Project Alpha Site, is located 66NM to the south of the Project Bravo Site.

RNLI Lifeboats

15.84. Based on the location of the Project Bravo Site it is likely that ALBs from Arbroath or Montrose would respond to an incident. This is confirmed when reviewing the historical incident data.

Transmission Asset Project

Navigational Features

15.85. The navigational features relative to the Transmission Asset Project are presented in Figure 15.16. The Export Cable makes land fall approximately 0.75NM south of Carnoustie.

15.86. The Export Cable Route (ECR) corridor intersects part of the Barry Buddon Military PEXA D604 (weapons firing and demolition) off Buddon Ness on the northern side of the River Tay.

15.87. The ECR corridor passes 2NM north of the River Tay Pilotage station and 600m north of a charted spoil ground. Admiralty Sailing Directions for the area (UKHO, 2009) also indicate that an anchorage is available approximately 0.7NM off the coast of Buddon Ness in a depth of 6.1m.

15.88. There is a charted foul 1NM south of the ECR corridor. The foul is charted at 4.2m and is to be avoided by vessels anchoring or trawling as it could pose a snagging hazard to them.

Marine Traffic Surveys

Shipping Surveys (2011)

15.89. Figure 15.17 presents the AIS and radar shipping tracks recorded during the 40 day survey period in March 2011 and June/ July 2011 within the Transmission Asset Project ISA.

15.90. Vessels intersecting the ECR corridor are generally headed in a north east-south west direction to/ from the Firth of Forth a north west-south east direction to/ from Montrose.

15.91. A chart of the anchored vessels is presented in Figure 15.18. It can be observed that a number of vessels were recorded at anchor approximately 0.8NM south of the ECR corridor (within 2NM of the Tay Pilotage station). Vessels were also recorded at anchor within Saint Andrews Bay which is located 7.5NM south of the ECR corridor and within Lunan Bay which is approximately 5NM north.

15.92. An offshore support vessel was recorded at anchor within the ECR corridor, with two chemical/ products tankers anchoring within 1NM of the ECR corridor.

Coastal Survey Data (2010)

15.93. The coastal shipping data collected within the Transmission Asset Project ISA as part of FTOWDG are presented in Figure 15.19 (56 days in June/ November 2010) and a plot of the anchored vessels is presented in Figure 15.20.

15.94. It can be seen that vessels intersecting the ECR corridor were generally headed in a north east-south west direction to/ from the Firth of Forth and a north west-south east direction to/ from Montrose.

15.95. Two chemical/ products tankers were recorded at anchor within 1NM of the ECR corridor; 1 within the ECR corridor and the other approximately 0.5NM to the south.

Comparison of Survey Data

15.96. As was the case for Project Alpha and Project Bravo, there was good consistency between the EEMS/ Highland Eagle survey data and the coastal data collected for the Transmission Asset Project in terms of the main routes identified. Anchorage areas were also consistent.

15.97. It is noted that the coastal data provide increased coverage to the south of the ECR corridor and the area around Bell Rock when compared to the shipping survey data.

Fishing Vessel Activity

15.98. Fishing satellite surveillance data have been converted to fishing vessel density plots and are presented in Figure 15.21. These data show that there is a higher density of fishing vessel activity on the eastern part of the ECR corridor, when compared to the western part towards the landfall at Carnoustie.

15.99. The fishing vessel types in the Transmission Asset Project ISA were largely scallop dredgers and stern trawlers (including demersal stern trawlers) with the majority of vessels being UK-registered.

Recreation Vessel Activity

15.100. From the RYA data presented in Figure 15.11, it can be seen that the ECR corridor is intersected by four medium use cruising routes, two of which are headed between north eastern Scotland (Stonehaven/ Peterhead) and the Firth of Tay and Firth of Forth and two of which are headed to/ from Arbroath. The ECR corridor intersects a 'general sailing' area within approximately 3NM of the coast. There is a sailing and boating club at Arbroath which holds a number of events and races during the summer.

Maritime Incidents

15.101. This section reviews maritime incidents that have occurred within the Transmission Asset Project ISA over the last 10 years.

MAIB Incident Data

15.102. Figure 15.22 presents the MAIB incidents recorded from January 2001 to December 2010 within the Transmission Asset Project ISA.

15.103. A total of 49 incidents were recorded within the Transmission Asset Project ISA over the ten years analysed, involving 52 vessels, corresponding to an average of five incidents per year.

15.104. No incidents were recorded within the ECR corridor. The closest incident was a machinery failure on a fishing vessel in December 2001 approximately 0.4NM north of the ECR corridor.

RNLI Incident Data

15.105. Figure 15.23 presents the RNLI incidents recorded from January 2001 to December 2010 within the Transmission Asset Project ISA.

15.106. A total of 535 unique incidents were recorded within the Transmission Asset Project ISA over the ten years analysed, corresponding to an average of 54 incidents per year. However, the vast majority of these were on or near the coast and involved people getting into danger.

15.107. Five incidents were recorded within the ECR corridor with incidents involving accidents to people (2 incidents), personal craft (2 incidents) and fishing vessels (1 incident).

ASSESSMENT OF IMPACTS – WORST CASE SCENARIO

15.108. A combination of quantitative and qualitative investigation has been carried out to assess the impact and risk of constructing, operating and decommissioning the Seagreen Project with regard to shipping and navigation.

15.109. The scenario for the Seagreen Project that would result in the most significant impacts and risks for shipping and navigation is when the largest number of Wind Turbine Generators (WTGs) are installed and therefore there is maximum loss of navigable sea room and greatest collision risk due to geometric factors. The largest number of WTGs for the Project Alpha and Project Bravo Sites is 150 WTGs (i.e. 75 in the Project Alpha Site and 75 in the Project Bravo Site). For assessing the impact on shipping and navigation, it has been assumed that WTGs will be 30m in diameter at sea level.

15.110. For the worst case collision risk modelling, connection Scenario 1 (see Chapter 5: Project Description) the structures described in Table 15.4 have been placed on the periphery of the OWF boundaries as this is where they are most exposed. The indicative OWF infrastructure layout used to assess the worst case is presented in Figure 15.24.

Table 15.4 Non-WTG OWF structures used in Worst Case Collision Risk Modelling

Structure	Number	Dimensions
High Voltage Alternating Current (HVAC) Collector Stations	Up to four (two per project)	40 x 40m
High Voltage Direct Current (HVDC) Converter Station	one (in Project Alpha)	100 x 75m
Meteorological Masts	Up to six (three per project)	30m diameter

15.111. In addition to the structures described above, there will also be wave buoys deployed around the OWFs (three in Project Alpha and three in Project Bravo). The wave buoys are approximately 1m in diameter and will be moored to the seabed in close proximity to the boundary of the OWFs. Due to the position and size of these structures it was not felt that detailed modelling was required and they were therefore not included in the collision risk modelling for Project Alpha or Project Bravo.

15.112. A variation of the layout which does not contain any infrastructure along the boundary between the Project Alpha and Project Bravo Sites is presented in Figure 15.25. This gap is approximately 1.5NM wide and may be used by vessels navigating in the area, therefore creating an addition hazard due to vessels transiting in a narrow gap in close proximity to OWF structures where there may be crossing traffic. It also creates an issue with vessels emerging from the gap into traffic adjacent to the OWF.

15.113. In the case of the export cable, the scenario which represents the absolute worst case to shipping and navigation is that the cable is not buried, however this is not realistic. The realistic worst case scenario for shipping and navigation that has been assumed is that cables will be buried where possible. Where burial is not possible due to seabed conditions, other protection means such as concrete mattresses and rock dumping will be used to protect the cable (it is assumed that a maximum of 5% of cables will not be buried).

IMPACT ASSESSMENT – INTRODUCTION

15.114. Due to the similarities between Project Alpha and Project Bravo, the impact assessment has been carried out for both projects together. Where there are differences between the two projects (i.e. in the outputs of the collision risk modelling) these are stated in the text.

IMPACT ASSESSMENT – CONSTRUCTION PHASE

15.115. In general, whilst the same impacts apply in the construction phase as during the operational phase, there are additional impacts associated with the construction of the Seagreen Project that require to be assessed.

15.116. In terms of the main navigational receptors, the overall impact associated with the Seagreen Project will be identified and discussed below for the construction phase of the project.

Project Alpha and Project Bravo

Impact of OWF Construction on Commercial Vessels

15.117. During the construction phase of the Project Alpha and Project Bravo OWF components and infrastructure (including WTGs, array cables, foundations, substructures and meteorological masts) there will be an increased level of vessel activity within Project Alpha and Project Bravo (including jack-ups/ barges, mothership(s) and transfer vessels). The presence of construction traffic could lead to an increase in vessel-to-vessel encounters and collision risk in the area when compared to baseline conditions.

15.118. Based on the analysis of the marine traffic data, it is considered that commercial vessel activity around the Project Alpha and Project Bravo is relatively low with a number of low trafficked routes passing through and in close proximity to the sites. The principal routes that will be affected during construction works are the north-south routes between Aberdeen/ Northern Scottish ports and Humber/ European ports. The busiest of these routes is used by an estimated 1.6 vessels per day and passes through both Project Alpha and Project Bravo. Vessels on these routes, and others which intersect the sites, are expected to make minor deviations to increase their passing distance around construction activities. Rolling construction safety zones will be in place up to 500m from the construction activities and there may be more than one present at any one time. It is expected that vessels will deviate around these rolling construction safety zones.

15.119. The impact on commercial vessels directly arises from the activities associated with the construction of the OWF. Impacts associated with construction activities will be temporary in nature throughout the construction phase of Project Alpha and Project Bravo which is estimated to take three years. The impacts are likely to be localised to the current area of construction activities and will be of limited duration when considered against the life time of the project.

15.120. When marine traffic survey data collected as part of the NRA are considered against expert opinion and the outcomes of the hazard workshop, this impact is considered likely to occur.

15.121. However the low traffic levels and the available sea room for commercial vessel deviations around construction works means the number of actual encounters with construction activities will be of a low frequency and, when considered with the temporary nature of the work, this means the impact is **not significant** for Project Alpha and **not significant** for Project Bravo.

Impact of OWF Construction on Fishing Vessels

15.122. Fishing vessels that use the Project Alpha and Project Bravo Sites could be impacted during the construction of the sites OWF components and infrastructure (including WTGs, array cables, foundations, substructures and meteorological masts), due to the presence of construction traffic. This construction traffic could lead to an increase in vessel-to-vessel encounters and collision risk in the area when compared to baseline conditions.

15.123. A number of fishing vessels were recorded within the Project Alpha and Project Bravo Sites during the maritime surveys in March 2011 and June/ July 2011. This included vessels engaged in fishing and transiting through the site. Fishing vessels are expected to make minor deviations to increase their passing distance around construction activities. Rolling construction safety zones will be in place up to 500m from the construction activities and there may be more than one present at any one time. It is expected that fishing vessels will deviate around these rolling construction safety zones and also keep their gear out of this zone.

15.124. The construction works in Project Alpha and Project Bravo may displace commercial and recreational vessels into areas used by fishing vessels, and vice versa, leading to an increase in vessel-to-vessel encounters and collision risk for fishing vessels.

15.125. Fishing vessels will also be impacted by the installation of array cables, which have the potential to create a snagging hazard for gear or change the seabed conditions which creates an additional hazard for fishing vessels operating in the area. The majority of array cables will be buried, with approximately 10% being protected by other means (i.e. rock placement or concrete mattresses). In Chapter 14: Commercial Fisheries the potential safety risks associated with fishing in the vicinity of the array cables are considered to be outside of acceptable limits (see paragraph 14.175), and therefore significant under the EIA regulations, until successful burial and/ or protection of the cables is completed. This would be confirmed by post-installation surveys as appropriate and, if necessary, corrective measures where target burial depth has not been achieved. Specific mitigation in respect of potential impacts on fishing activities will also involve ongoing dialogue through the pre-construction and construction phase to ensure all safety risks identified as outside of acceptable limits will be brought within acceptable limits (see Chapter 14, paragraphs 14.187 to 14.193).

15.126. The potential impact on fishing vessels directly arises from the activities associated with the construction of the OWF. Impacts associated with these construction activities will be temporary in nature throughout the construction phase of Project Alpha and Project Bravo which is estimated to take up to three years. The impacts are likely to be localised to the current area of construction activities and will be of limited duration when considered against the lifetime of the project.

15.127. When fishing vessel survey data collected as part of the NRA are considered against expert opinion and the outcomes of the hazard workshop, this impact is considered likely to occur.

15.128. However, the relatively low level of fishing vessel activity and the available sea room for fishing vessels to deviate around construction works and the fact that cables will be suitably buried/ protected means the number of actual encounters with construction traffic and/ or incidence of snagging will be of a low frequency and, when considered with the temporary nature of the work, this means the impact is **not significant** for Project Alpha and **not significant** for Project Bravo.

15.129. Further details on the assessment of safety risks on fishing activity can be found in Chapter 14: Commercial Fisheries of this ES.

Impact of OWF Construction on Recreational Vessels

15.130. Recreational vessels passing through Project Alpha and Project Bravo could be impacted during the construction of the Project Alpha and Project Bravo OWF components and infrastructure (including WTGs, array cables, foundations, substructures and meteorological masts), due to the presence of construction traffic. This construction traffic could lead to an increase in vessel-to-vessel encounters and collision risk in the area when compared to baseline conditions.

15.131. A number of recreational vessels were recorded within the Project Alpha and Project Bravo sites during the summer maritime survey in June/ July 2011. The majority of recreational vessels were heading in a north-south direction to/ from Northern Scottish marinas including Peterhead. Recreational vessels are expected to make minor deviations to increase their passing distance around construction activities. Rolling construction safety zones will be in place up to 500m from the construction activities and there may be more than one present at any one time.

15.132. The construction works in Project Alpha and Project Bravo may displace commercial and fishing vessels onto routes used by recreational vessels, and vice versa, leading to an increase in vessel-to-vessel encounters and collision risk for recreational vessels.

15.133. The impact on recreational vessels directly arises from the activities associated with the construction of the OWF. Impacts associated with these construction activities will be temporary in nature throughout the construction phase of project Alpha and Project Bravo which is estimated to take up to three years. The impacts are likely to be localised to the current area of construction activities and will be of limited duration when considered against the lifetime of the project.

15.134. When recreational vessel survey data collected as part of the NRA are considered against expert opinion and the outcomes of the hazard workshop, this impact is considered likely to occur.

15.135. However, the relatively low level of recreational vessel activity and the available sea room for recreational vessels to deviate around construction works means the number of actual encounters with construction traffic will be of a low frequency and, when considered with the temporary nature of the work, this means the impact is **not significant** for Project Alpha and **not significant** for Project Bravo.

Transmission Asset Project

Impact of Export Cable Installation on Commercial Vessels

15.136. During the construction phase of the Seagreen Project, the presence of cable installation vessels along the ECR corridor could pose a risk to commercial vessels. This is due to the increased level of vessel activity and the limited manoeuvrability of the cable installation vessels (restricted in their ability to manoeuvre under COLREGs) therefore potentially leading to an increase in vessel-to-vessel encounters and an increased risk of collision in the area when compared to baseline conditions.

15.137. Based on analysis of the marine traffic data, it was identified that a number of low trafficked commercial shipping routes cross the ECR corridor, with defined traffic routes heading in a north east-south west direction to/ from the Firth of Forth and north west-south east to/ from Montrose. Vessels on these routes will be exposed to a greater level of vessel-to-vessel collision risk during the cable installation. There will also be an impact on the routing of these vessels, because they will be required to make minor deviations to avoid the cable installation vessels.

15.138. This impact on commercial vessel routing directly arises from the activities associated with the installation of the export cable over a two year period. The potential impacts will be temporary in nature occurring, intermittently for a duration of up to nine months in total within this period. The impacts are likely to be localised to the current area of cable installation activities and will be of limited duration when considered against the life time of the project.

15.139. When marine traffic survey data collected as part of the NRA are considered against expert opinion and the outcomes of the hazard workshop, this impact is considered likely to occur.

15.140. However, the low traffic levels and the available sea room for vessel deviations around cable installation activities means the number of actual encounters with installation vessels will be of a low frequency and, when considered with the temporary nature of the work, this means the impact is **not significant**.

Impact of Export Cable Installation on Fishing Vessels

15.141. During the construction phase of the Seagreen Project, the presence of cable installation vessels along the ECR corridor can pose a risk to fishing vessels transiting in the area. This is due to the increased level of vessel activity and the limited manoeuvrability of the cable installation vessels (restricted in their ability to manoeuvre under COLREGs), therefore potentially leading to an increase in vessel-to-vessel encounters and an increased risk of collision in the area when compared to baseline conditions.

15.142. Transiting fishing vessels will be required to make minor deviations to their routes to avoid the cable installation vessels.

15.143. This impact on commercial vessel routing directly arises from the activities associated with the installation of the export cable over a two year period. The potential impacts will be temporary in nature occurring intermittently for a duration of up to nine months in total within this period. The impacts are likely to be localised to the current area of cable installation activities and will be of limited duration when considered against the life time of the project.

15.144. Fishing vessels will also be impacted by the laying of the export cables which have the potential to create a snagging hazard for gear or change the seabed conditions which creates an additional hazard for fishing vessels operating in the area. The total duration of construction activity across all export cables will be up to nine months within a two year period.

15.145. The majority of export cables will be buried, although approximately 5% of the export cables may be protected by other means (i.e. rock placement or concrete mattresses). Due to the potential safety risks associated with fishing in the vicinity of these cables (either by snagging on cables or as a result of changes to the seabed conditions), it is considered that temporary loss of access to fishing grounds applies to the length of the ECR corridor (70km by 1km).

15.146. In Chapter 14: Commercial Fisheries (see paragraph 14.212) the potential safety risks associated with fishing in the vicinity of the export cables are considered to be outside of acceptable limits, and therefore significant under the EIA regulations, until successful burial and/ or protection of the cables is completed. This would be confirmed by post-installation surveys as appropriate and, if necessary, corrective measures where target burial depth has not been achieved. Specific mitigation in respect of potential impacts on fishing activities will also involve ongoing dialogue through the pre-construction and construction phase to ensure all safety risks identified as outside of acceptable limits will be brought within acceptable limits (see Chapter 14, paragraphs 14.220 to 14.223).

15.147. When fishing vessel survey data collected as part of the NRA are considered against expert opinion and the outcomes of the hazard workshop, this impact is considered likely to occur.

15.148. However, the relatively low level of fishing vessel activity and the available sea room for fishing vessels to deviate around cable installation activities and the fact that the export cables will be suitably buried/ protected means the number of actual encounters with installation vessels and/ or incidence of snagging will be of a low frequency and, when considered with the temporary nature of the work, this means the impact is **not significant**.

15.149. Further details on the assessment of safety risk on fishing activity can be found in Chapter 14: Commercial Fisheries of this ES.

Impact of Export Cable Installation on Recreational Vessels

15.150. During the construction phase of the Seagreen Project, the presence of cable installation vessels along the ECR corridor may pose a risk to recreational vessels. This is due to the increased level of vessel activity and the limited manoeuvrability of the cable installation vessels (restricted in their ability to manoeuvre under COLREGs), therefore potentially leading to an increase in vessel-to-vessel encounters and an increased risk of collision in the area when compared to baseline conditions.

15.151. Based on the RYA data for the area, the ECR corridor is intersected by four medium use cruising routes, two of which are headed between north eastern Scotland (Stonehaven/ Peterhead) and the Firth of Tay and Firth of Forth and two of which are headed to/ from Arbroath. Vessels on these routes will be required to make minor deviations to avoid the cable installation vessels.

15.152. This impact on commercial vessel routing directly arises from the activities associated with the installation of the export cable over a two year period. The potential impacts will be temporary in nature occurring intermittently for a duration of up to nine months in total within this period. The impacts are likely to be localised to the current area of cable installation activities and will be of limited duration when considered against the lifetime of the project.

15.153. When recreational vessel survey data collected as part of the NRA and RYA data are considered against expert opinion and the outcomes of the hazard workshop, this impact is considered likely to occur.

15.154. However, the relatively low level of recreational vessel activity and the available sea room for recreational vessels to deviate around cable installation activities means the number of actual encounters with installation vessels will be of a low frequency and, when considered with the temporary nature of the work, this means the impact is **not significant**.

Impact of Transmission Asset Project Infrastructure Installation on Commercial Vessels

15.155. The Transmission Asset Project infrastructure (HVAC collector stations and HVDC converter stations) has been assumed to be located within the Project Alpha and Project Bravo Sites so the impact to commercial vessels from their installation has been included above in the section 'Impact of OWF Construction on Commercial Vessels' (paragraphs 15.117 to 15.121).

Impact of Transmission Asset Project Infrastructure Installation on Fishing Vessels

15.156. The Transmission Asset Project infrastructure (HVAC collector stations and HVDC converter stations) has been assumed to be located within Project Alpha and Project Bravo so the impact to fishing vessels from their installation has been included above in the section 'Impact of OWF Construction on Fishing Vessels' (paragraphs 15.122 to 15.129).

Impact of Transmission Asset Project Infrastructure Installation on Recreational Vessels

15.157. The Transmission Asset Project infrastructure (HVAC collector stations and HVDC converter stations) has been assumed to be located within Project Alpha and Project Bravo so the impact to recreational vessels from their installation has been included above in the section 'Impact of OWF Construction on Recreational Vessels' (paragraphs 15.130 to 15.135).

IMPACT ASSESSMENT – OPERATION

15.158. A revised shipping routing pattern following construction of Project Alpha and Project Bravo has been estimated based on the review of the baseline shipping data. Four risk assessments were carried out as outlined below:

- base case without OWF level of risk;
- base case with OWF level of risk;
- future case without OWF level of risk; and
- future case with OWF level of risk.

15.159. The following scenarios were investigated in detail:

- vessel-to-vessel collisions; and
- vessel-to-OWF structure collisions (powered and drifting).

Project Alpha and Project Bravo

Impact of OWF on Commercial Vessel Routing

15.160. The main impact on commercial vessels during the operational phase of Project Alpha or Project Bravo will be the displacement of vessels from their regular routes due to the presence of OWF components and infrastructure (including WTGs, substructures and meteorological masts). The most heavily trafficked route impacted by the site is presently used by an estimated 1.6 vessels per day between Aberdeen and Humber and passes through the Project Alpha and Project Bravo Sites in a north-south direction.

15.161. Vessels are predicted to make deviations to their routes to pass the Project Alpha and Project Bravo Sites in the order of 1 to 1.5NM during the operational phase of the OWF. Of the eight main routes identified during work carried out as part of the NRA (see Appendix J1), seven of these routes will be impacted by Project Alpha and seven will be impacted by Project Bravo. It is anticipated that these vessels will either route to the east or the west of the Project Alpha or Project Bravo Sites, depending on the implication on voyage distance and individual preferences. The increased voyage distances have been estimated to be up to 2.4NM on the busiest routes which currently pass through the Project Alpha and Project Bravo Sites.

15.162. It is considered that there is sufficient sea room surrounding Project Alpha and Project Bravo for commercial vessels to pre-plan any revised passage in advance of encountering the OWF and there will only be a minor increase to voyage distance and time.

15.163. The impact on commercial vessel routing directly arises from the presence of structures within Project Alpha or Project Bravo. Marine traffic survey data indicates that vessel deviations will be frequent when considering the size of the development and the number of routes impacted. This will continue throughout the lifetime of the Seagreen Project as for the duration that the structures are in place, there is no potential for vessels to return to current routing patterns. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.164. When outcomes of the NRA are considered along with stakeholder consultation and the results of the hazard workshop, this impact is considered likely to occur.

15.165. However, the low traffic levels and the available sea room for commercial vessels to make early course alterations without major time or distance implications mean this impact is **not significant** for Project Alpha and **not significant** for Project Bravo.

Impact of OWF on Commercial Vessel Collision Risk

15.166. The presence of OWF components and infrastructure (including WTGs, substructures and meteorological masts) in Project Alpha or Project Bravo has the potential to increase vessel to vessel collisions (note this includes commercial, fishing and recreation vessels) due to vessels being deviated from their main routes. The baseline vessel-to-vessel collision risk level pre-OWF development within 10NM of the project boundary is 1 major collision in approximately 1,899 years (Project Alpha) and 1 major collision in approximately 3,094 years (Project Bravo). Based on the collision risk modelling undertaken for the revised traffic patterns, the collision risk was estimated to increase to 1 major collision in approximately 982 years (Project Alpha) and 1 major collision in approximately 1,561 years (Project Bravo). The collision risk modelling is explained in more detail in Sections 14 and 15 of Appendix J1.

15.167. The changes in vessel-to-vessel collision frequency due to the sites were estimated to be 4.9 x 10^{-4} per year (Project Alpha) and 3.2 x 10^{-4} per year (Project Bravo). These changes are both assessed to be relatively low.

15.168. Commercial vessels also have the potential to collide with OWF components and infrastructure (including WTGs and meteorological masts) in the Project Alpha or Project Bravo Sites. These could be either powered collisions, e.g., due to watchkeeeper failure, or drifting collisions, e.g., due to machinery failure.

15.169. In terms of an errant vessel under power deviating from its route to the extent that it comes into proximity with structures within the sites, the collision return period was estimated to be approximately 1 every 3,947 years (Project Alpha) and 1 every 2,272 years (Project Bravo).

15.170. The drifting collision risk has been identified as approximately 1 every 27,981 years (Project Alpha) and approximately 1 every 23,498 years (Project Bravo). Drifting collisions are identified as being less frequent than powered collisions, which is in line with historical data. There have been no reported 'passing' drifting ('Not under Command') ship collisions with offshore installations on the United Kingdom Continental Shelf (UKCS) in over 6,000 operational years. Whilst a number of drifting ship incidents are recorded each year in UK waters, most vessels have been recovered in time, (e.g. anchored, restarted engines or taken in tow).

15.171. The impact on commercial vessels directly arises from the presence of structures within the Project Alpha or Project Bravo Sites. This will continue throughout the lifetime of the Seagreen Project as whilst structures are in place there is the potential for vessel to vessel or vessel to structure collisions to occur. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.172. When collision risk modelling results and outcomes from the hazard workshop are considered, this impact is assessed as being moderately likely to occur. Whilst the collision risk modelling results for Project Alpha and Project Bravo are not identical, expert opinion has confirmed that the level of the impact is not likely to differ between Project Alpha and Project Bravo.

15.173. Given the likelihood of occurrence and extended duration of the impact on vessel to vessel and vessel to structure collision risk, this impact is considered to be **significant** for Project Alpha and **significant** for Project Bravo.

Impact of OWF on Fishing Vessels

15.174. From a shipping and navigation perspective, the main impact on fishing vessels during the operational phase of Project Alpha or Project Bravo will be vessel collision with OWF components and infrastructure (including WTGs, substructures and meteorological masts). The fishing vessel to OWF structure collision risk has been identified as approximately 1 every 49 years (Project Alpha) and 1 every 96 years (Project Bravo). This estimated frequency conservatively assumes that fishing vessel density in and around the OWF following development will remain the same as current levels identified in the baseline. The NRA (Appendix J1) should be referred to for a more detailed explanation of the collision risk models. In terms of the consequences of these collisions, is it expected that the majority will be relatively low speed and hence low energy during fishing itself and there will be relatively low levels of risk to crew and of pollution.

15.175. The impact of vessel to vessel collisions for fishing vessels has been included in the above section 'Impact of OWF on Commercial Vessel Collision Risk' (paragraphs 15.165 to 15.172).

15.176. In terms of fishing vessel navigation, it is not anticipated that fishing vessels will be excluded from the Project Alpha and Project Bravo sites during operation. The impact on vessels steaming through the site to fishing grounds can be considered similar to other passing vessels (i.e. commercial vessels). However, it is noted that due to the smaller size of vessels and the spacing between structures, there is good prospect for fishing vessels to navigate between the structures in the Project Alpha and Project Bravo sites. The decision to do this will ultimately lie with the skipper who will be responsible for assessing the risks associated with navigating in proximity to and through an OWF. This decision is likely to be based on the type and size of fishing vessel and sea, weather and visibility conditions at the time.

15.177. Fishing vessels either exiting the OWF or routing around it are likely to encounter more commercial vessels and recreational vessels, thus increasing the likelihood of encounters and collision risk.

15.178. Fishing vessels may also be impacted by the presence of array cables which have the potential to cause gear snagging for vessels fishing in the area. The issue of safety for fishing vessels in this regard is also addressed in Chapter 14: Commercial Fisheries (see paragraph 14.246)

15.179. The impact on fishing vessels directly arises from the presence of structures within the Project Alpha or Project Bravo sites. This will continue throughout the lifetime of the Seagreen Project as whilst structures are in place there is the potential for fishing vessel safety to be impacted. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.180. When outcomes of the NRA are considered along with stakeholder consultation and the results of the hazard workshop, this impact is considered likely to occur.

15.181. However, given the low level of fishing vessel activity, the fact that cables will be suitably buried/ protected and the fact that incidents will be of low severity (i.e. minor vessel damage), the impact on fishing vessels is considered to be **not significant** for Project Alpha and **not significant** for Project Bravo.

Impact of OWF on Recreational Vessels

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

15.183. The main impact on recreational vessels during the operational phase of Project Alpha or Project Bravo will be the potential loss of recreational routes due to the presence of OWF components and infrastructure (including WTGs, foundations, substructures and meteorological masts). The Project Alpha site is intersected by two 'medium-use' cruising routes and the Project Bravo site is intersected by one 'medium-use cruising route' which run in a north-south direction. However, vessels should be able to pass between turbines in suitable conditions (i.e. during good visibility and calm sea conditions), as well as being able to route around the Project Alpha and Project Bravo sites.

15.184. The impact of vessel to vessel collisions for recreational vessels has been included in the above section 'Impact of OWF on Commercial Vessel Collision Risk' (paragraphs 15.166 to 15.173). In terms of recreational vessel collisions with OWF structures (including WTGs and meteorological masts), fog or poor visibility is considered to be the highest risk period. However, no recreational vessels were recorded during the winter survey (March 2011), suggesting that recreational vessels are unlikely to transit the area in poor weather conditions.

15.185. Recreational vessels either exiting the OWF or routing around it are likely to encounter more commercial vessels and fishing vessels, thus increasing the likelihood of encounters and collision risk.

15.186. The impact on recreational vessels directly arises from the presence of structures within the Project Alpha or Project Bravo sites. Marine traffic survey data and RYA data indicates that recreational vessels will occasionally be required to make deviations around Project Alpha or Project Bravo or pass between the turbines if they are to continue using their current routes. This will continue throughout the lifetime of the Seagreen Project whilst structures are in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.187. When expert opinion, stakeholder consultation and the outcomes of the hazard workshop, were considered this impact is likely to occur.

15.188. However, the relatively low level of recreational vessel activity and the available sea room for recreational vessels to pass around the Project Alpha or Project Bravo sites or between the structures mean this impact is **not significant** for Project Alpha and **not significant** for Project Bravo.

Impact of OWF on Search and Rescue (SAR) Operations

15.189. The presence of structures in Project Alpha or Project Bravo has the potential to increase the need for search and rescue responses and hinder operations by restricting access to casualties within the site. However, structures in Project Alpha or Project Bravo can also aid search and rescue attempts by providing a point of reference and safe refuge for casualties. Furthermore, OWF maintenance vessels will be working regularly in the Project Alpha and Project Bravo Sites and these will offer good prospect of assisting in emergency response.

15.190. The Project Alpha and Project Bravo sites lie within the Scotland and Northern Ireland SAR region with the nearest rescue coordination centre located at Marine Rescue Coordination Centre (MRCC) Aberdeen. It is noted that under the revised MCA SAR proposals (MCA, 2011), the Aberdeen centre will become a Marine Rescue Sub Centre (MRSC).

15.191. A review of historical incidents from MAIB and RNLI data indicated that the accident levels in the vicinity of the Project Alpha and Project Bravo sites have tended to be low with the majority of incidents occurring near the coast, although this may increase once the OWF is in place.

15.192. The impact on search and rescue operations directly arises from the presence of structures within the Project Alpha or Project Bravo sites. This will continue throughout the lifetime of the Seagreen Project as whilst structures are in place there is no potential for search and rescue operations to return to as they were before the construction of Project Alpha or Project Bravo. This also mean that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.193. Outcomes of the hazard workshop and stakeholder consultation indicate that this impact is likely to occur.

15.194. Given the fact that Project Alpha or Project Bravo has the potential to increase the requirement for search and rescue operations and hinder such attempts throughout the entire lifetime of the Seagreen Project, this impact is considered to be **significant** for Project Alpha and **significant** for Project Bravo.

Impact of OWF on Marine Radar Systems

15.195. Trials on the impact of OWFs on marine radar systems have been carried out at North Hoyle (QinetiQ, 2004) and Kentish Flats (BWEA, 2007). The results of the trials indicate that the onset range from the WTG structures of significant false returns is about 1.5NM, with a progressive increase in the impact of the effects on radar as the boundary is approached.

15.196. Commercial vessels on a number of routes passing north-south and east-west through the Project Alpha or Project Bravo Sites are likely to pass within the 1.5NM range from WTGs at which radar interference could be experienced (see Section 17 of Appendix J1). Fishing and recreation vessels within and in close proximity to the Project Alpha or Project Bravo Sites will also be subject to a level of radar interference. There is available sea room on all sides of the Project Alpha or Project Bravo Sites for vessels to increase their passing distance from the turbines, thus reducing the effect on marine radar systems.

15.197. The potential radar interference is mainly a problem during the night and periods of bad visibility when mariners may not be able to visually confirm the presence of other vessels in the vicinity. AIS information can be used to verify the targets of larger vessels, generally ships above 300 tonnes and fishing vessels over 24m (15m after 2014), and therefore the reduction in radar tracking performance is of particular relevance to the tracking of those vessels without AIS installed (usually smaller fishing and recreational craft).

15.198. The impact on marine radar systems directly arises from the presence of structures within the Project Alpha or Project Bravo Sites. This will continue throughout the lifetime of the Seagreen Project whilst structures are in place. This also mean that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended. As previously mentioned, there is some potential for the impact to become less frequent as more vessels are required to carry AIS.

15.199. Given that there is available sea room around the Project Alpha or Project Bravo Sites for vessels to increase their passing distance from turbines and consequently reduce the impact on marine radar systems, this impact is considered to be **not significant** for Project Alpha and **not significant** for Project Bravo.

Transmission Asset Project

Impact of Export Cable on Commercial Vessels

15.200. The main impact on commercial vessels from the export cable will be for those vessels anchoring in close proximity.

15.201. An anchorage is available approximately 1.9NM south of the ECR corridor (4.5NM east of Buddon Ness in the vicinity of the Fairway Light Buoy where the water depth is around 20m). Based on the data collected in the maritime traffic surveys, vessels were recorded at anchor within the ECR corridor and at locations approximately 0.8NM south of the ECR corridor (within 2NM of the Tay Pilotage station), within Saint Andrews Bay which is located 7.5NM to the south and within Lunan Bay which is approximately 5NM to the north. Vessels anchoring within the ECR corridor are expected to anchor elsewhere following the installation of the export cable.

15.202. Vessels may also require to anchor in an emergency situation, should they suffer machinery failure and be drifting towards a hazard. Before releasing anchor, a vessel would assess the risk in the area and, where possible, avoid anchoring in proximity to a cable.

15.203. This impact on commercial vessels directly arises from the presence of the export cable. Marine traffic survey data indicates that vessel anchoring will be relatively frequent in proximity to the ECR corridor. The impact will continue throughout the lifetime of the Seagreen Project whilst the export cable is in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended. At the decommissioning stage of the Seagreen Project an assessment will made as to whether or not the export cable will remain in situ.

15.204. When the anchoring practices identified in the marine traffic data are considered, it has been assessed that it is likely that this impact will occur.

15.205. The proximity of the ECR corridor to a designated anchorage means there is a high likelihood of anchoring close to the export cable. However, given that cables will be buried where possible, this impact is **not significant**.

Impact of Export Cable on Fishing Vessels

15.206. The main impact on fishing vessels from the export cable in terms of safety is related to gear snagging on an unprotected or exposed cable or those running over spans, leading to damage/ loss of fishing gear and potentially the vessel capsizing. The fishing types considered to be the most risk to a subsea cable are demersal trawling and scallop dredging, both of which are amongst the common gear types found within the Transmission Asset Project ISA.

15.207. This impact on fishing vessels directly arises from the presence of the export cable and the issue of safety for fishing vessels in this regard is also considered in Chapter 14: Commercial Fisheries (see paragraphs 14.271). The impact will continue throughout the lifetime of the Seagreen Project whilst the export cable is in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended. At the decommissioning stage of the Seagreen Project an assessment will made as to whether or not the export cable will remain in situ.

15.208. Based on expert opinion, this impact is considered likely to occur. However, given that cables will be buried/ protected where possible, this impact is **not significant**.

15.209. The impact on fishing vessels is described in more detail in Chapter 14: Commercial Fisheries.

Impact of Export Cable on Recreational Vessels

15.210. The main impact on recreational vessels from the export cable will be for those recreational vessels anchoring in close proximity to the export cable.

15.211. This impact on recreational vessels directly arises from the presence of the export cable. The impact will continue throughout the lifetime of the Seagreen Project whilst the export cable is in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended. At the decommissioning stage of the Seagreen Project an assessment will made as to whether or not the export cable will remain in situ.

15.212. However, anchoring of recreational vessels is unlikely in the ECR corridor apart from in the area closest to the shore where the water depth reduces (generally, recreational vessels will not anchor in water depths greater than 10m). The recreational vessel survey data did not record any recreational vessels at anchor in or near the ECR corridor.

15.213. Given that the recorded incidences and predicted likelihood of recreational vessels anchoring in proximity to the ECR corridor are low, this impact is considered to be **not significant.**

Impact of Export Cable on Vessel Navigational Equipment

15.214. Electromagnetic interference on ship-borne equipment including compasses has been identified as a potential impact to vessels when navigating in close proximity to ferrous structures or high voltage cables. Export cables carrying direct current have the potential to cause deflection of the compass needle. The amount of deflection depends on the magnitude of the electric current and the angle the cable makes with the magnetic meridian. Some vessels with an autopilot dependent upon a magnetic sensor may experience steering difficulties crossing the cable.

15.215. This impact on vessel navigation directly arises from the presence of the export cable. The impact will continue throughout the lifetime of the Seagreen Project whilst the export cable is in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended. At the decommissioning stage of the Seagreen Project this impact will be removed as there will be no current passing through the export cable and therefore no potential for electromagnetic interference.

15.216. Expert opinion and lessons learnt have confirmed that the impact on vessels from electromagnetic interference is unlikely to occur therefore this impact is considered **not significant**.

Impact of Transmission Asset Project Infrastructure on Commercial Vessels

15.217. The Transmission Asset Project infrastructure (HVAC collector stations and HVDC converter stations) has been assumed to be located within the Project Alpha and Project Bravo sites, so the impact to commercial vessels has been included in the above sections Impact of OWF on Commercial Vessel Routing (paragraphs 15.159 to 15.164) and Impact of OWF on Commercial Vessel Collision Risk (paragraphs 15.165 to 15.172).

Impact of Transmission Asset Project Infrastructure on Fishing Vessels

15.218. The Transmission Asset Project infrastructure (HVAC collector stations and HVDC converter stations) has been assumed to be located within the Project Alpha and Project Bravo sites so the impact to fishing vessels has been included in the above section 'Impact of OWF on Fishing Vessels' (paragraphs 15.173 to 15.180).

Impact of Transmission Asset Project Infrastructure on Recreational Vessels

15.219. The Transmission Asset Project infrastructure (HVAC collector stations and HVDC converter stations) has been assumed to be located within the Project Alpha and Project Bravo sites, so the impact to recreational vessels has been included in the above section 'Impact of OWF on Recreational Vessels' (paragraphs 15.182 to 15.188).

IMPACT ASSESSMENT – DECOMMISSIONING

15.220. The impacts, mitigations and residual impacts associated with decommissioning the sites are anticipated to be similar in nature and extent to those identified during the construction phase, although the impacts will decrease over time as the structures are removed.

15.221. A decommissioning plan in line with standard requirements will be developed and this is likely to lead to a revision of the existing ERCoP and associated safety procedures.

15.222. With regards to impacts on shipping and navigation, this will also include consideration of the scenario where on decommissioning and on completion of removal operations, an obstruction is left on site (attributable to the OWF structures) which is considered to be a danger to navigation and which it has not proved possible to remove.

15.223. Such an obstruction may require to be appropriately marked until such time as it is either removed or no longer considered a danger to shipping and navigation, the continuing cost of which would need to be met by the developer/ operator.

IMPACT ASSESSMENT – CUMULATIVE AND IN-COMBINATION

15.224. Having identified the potential impacts of Project Alpha, Project Bravo and the Transmission Asset Project on shipping and navigation in isolation, this section firstly considers the cumulative impacts of the Seagreen Project and then considers the Seagreen Project with other existing, consented or proposed developments and activities in the Firth of Forth region and beyond.

Seagreen Project Cumulative Impacts

15.225. It is important to draw together the impacts considered for Project Alpha, Project Bravo and the Transmission Asset Project, so that the development of the Seagreen Project can be seen in terms of its cumulative impacts on shipping and navigation.

Cumulative Impact of Seagreen Project on Commercial Vessel Routing

15.226. Due to the combined presence of Project Alpha, Project Bravo and the Transmission Asset Project, commercial vessels will be displaced from their regular routes in order to increase their passing distance from the OWF components and infrastructure.

15.227. During work carried out as part of the NRA, eight main routes were identified as intersecting Project Alpha and Project Bravo (see Appendix J1). Of these eight routes, seven will be impacted by Project Alpha in isolation and seven will be impacted by Project Bravo in isolation. The combined presence of Project Alpha and Project Bravo will impact all eight of the main routes, which corresponds to approximately five vessels per day on average being displaced.

15.228. As per the potential impact of Project Alpha, Project Bravo and the Transmission Asset Project in isolation on commercial vessel routing, the cumulative impact on commercial vessels routing directly arises from the presence of structures and will continue throughout the lifetime of the Seagreen Project because whilst structures are in place there is no

potential for vessels to return to current routing patterns. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.229. It is considered that there is sufficient sea room around the Seagreen Project for commercial vessels to pre-plan any revised passage in advance of encountering the OWF, thus resulting in a minor increase to voyage distances and times.

15.230. Due to the low traffic levels and the sufficient sea room available for vessels to make early course alterations, the cumulative impact on commercial vessel routing is assessed to be **not significant**.

Cumulative Impact of Seagreen Project on Commercial Vessel Collision Risk

15.231. Due to the combined presence of Project Alpha, Project Bravo and the Transmission Asset Project, there will be an increased collision risk for commercial vessels. Route deviations will increase the traffic density on routes which pass in close proximity to Project Alpha and Project Bravo, increasing the risk of vessel-to-vessel encounters and hence collisions.

15.232. The increased number of structures present when the Seagreen Project is built will also increase the risk of vessel to structure collisions.

15.233. As per the potential impact of Project Alpha, Project Bravo and the Transmission Asset Project in isolation on commercial vessels, the cumulative impact on commercial vessel collision risk directly arises from the presence of structures and will continue throughout the lifetime of the Seagreen Project. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.234. Based on the potential for an increased collision risk, the cumulative impact is assessed to be **significant**.

15.235. If the 1.5NM gap is created along the boundary between Project Alpha and Project Bravo (Figure 15.25), there is the potential for an increased risk to commercial vessels choosing to transit within it because of the increased likelihood of encounters and collisions. Given the effect this will have on navigational safety, this variation of the layout has also been assessed to be significant for commercial vessels.

Cumulative Impact of Seagreen Project on Fishing Vessels

15.236. Due to the combined presence of Project Alpha, Project Bravo and the Transmission Asset Project, there is the potential for fishing vessels to be impacted.

15.237. Fishing vessels transiting through Project Alpha and Project Bravo to/ from fishing grounds will spend a longer amount of time surrounded by OWF components and infrastructure when Project Alpha, Project Bravo and the Transmission Asset Project are all built, when compared to one being built in isolation. This is expected to increase the fishing vessel to structure collision risk.

15.238. There will also be an increased number of subsea cables which can be potential snagging hazards for fishing vessels operating in the area and an increased number of displaced commercial vessels that fishing vessels could collide with.

15.239. In Chapter 14: Commercial Fisheries (see paragraph 14.303 to 14.307) the potential safety risks associated with fishing in the vicinity of the array cables and export cables are considered to be outside of acceptable limits during construction, and therefore significant under the EIA regulations, until successful burial and/ or protection of the cables is completed. This would be confirmed by post-installation surveys as appropriate and, if necessary, corrective measures where target burial depth has not been achieved to bring safety risks within acceptable limits, as described for the site specific assessments.

15.240. As per the potential impact of Project Alpha, Project Bravo and the Transmission Asset Project in isolation on fishing vessels, the cumulative impact on fishing vessels directly arises from the presence of structures and will continue throughout the lifetime of the Seagreen Project whilst structures are in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.241. Due to the low level of fishing activity, the fact that cables will be suitably buried/ protected and the fact that incidents will be of low severity (i.e. minor vessel damage), the cumulative impact on fishing vessels is assessed to be **not significant**.

15.242. If the 1.5NM gap is created along the boundary between Project Alpha and Project Bravo (Figure 15.25) and used by commercial vessels, this will create an additional collision risk to fishing vessels exiting the OWF into this gap. Given the effect this will have on navigational safety, this variation of the layout has been assessed to make the impact **significant** for fishing vessels.

Cumulative Impact of Seagreen Project on Recreational Vessels

15.243. Due to the combined presence of Project Alpha, Project Bravo and the Transmission Asset Project, there is the potential for the loss of recreational routes due to the presence of OWF components and infrastructure.

15.244. Two RYA 'medium-use' cruising routes were identified as intersecting the Seagreen Project (Figure 15.11). Both of these routes intersect Project Alpha and one of the routes intersects Project Bravo. Therefore, the combined presence of Project Alpha, Project Bravo and the Transmission Asset Project will influence both of the cruising routes as well as the four routes crossing the ECR Corridor.

15.245. There is the potential for an increased vessel to structure collision risk because recreational vessels passing through the Project Alpha and Project Bravo Sites will spend a longer amount of time surrounded by OWF components and infrastructure when Project Alpha, Project Bravo and the Transmission Asset Project are all built, when compared to one being built in isolation.

15.246. There will also be an increased number of displaced commercial vessels that recreational vessels could collide with.

15.247. As per the potential impact of Project Alpha, Project Bravo and the Transmission Asset Project in isolation on recreational vessels, the cumulative impact on recreational vessels directly arises from the presence of structures and will continue throughout the lifetime of the Seagreen Project whilst structures are in place. This also means that the impact will be present for the duration of the Seagreen Project operational phase, which currently has an anticipated lifetime of 25 years, although repowering may allow the project to be extended.

15.248. It is considered that there is sufficient sea room for recreational vessels to pass around the Seagreen Project or between structures in the OWF.

15.249. Due to the low number of recreational vessels and the sea room available for vessels to pass around the Seagreen Project or between structures, the cumulative impact on recreational vessels is assessed to be **not significant**.

15.250. If the 1.5NM gap is created along the boundary between Project Alpha and Project Bravo (Figure 15.25) and used by commercial vessels, this will create an additional collision risk to recreational vessels exiting the OWF into this gap. Given the impact on navigational safety, this variation of the layout will make the impact **significant** for recreational vessels.

Cumulative Impact of Seagreen Project on Marine Radar Systems

15.251. Due to the combined presence of Project Alpha and Project Bravo, the impact will be increased due to the greater number of structures. However, given that there is sufficient sea room for vessels to avoid the turbines, it has been assessed that this impact is **not significant**.

15.252. If the 1.5NM gap is created along the boundary between Project Alpha and Project Bravo (Figure 15.25) then this will impact the radar system of vessels transiting through the gap as trials have indicated the onset range from the OWF structures of significant false returns is approximately 1.5NM (QinetiQ, 2004 and BWEA, 2007). Therefore, this variation of the layout will increase the impact to **significant**.

Seagreen Project Cumulative Impact with Other Schemes

15.253. Two other OWFs in the Firth of Tay and Firth of Forth region are currently in the planning process and are considered relevant to this cumulative assessment. These are the Inch Cape OWF (Inch Cape) and Neart na Gaoithe OWF (Neart na Gaoithe), both of which are located inshore of the Seagreen Project.

15.254. Cumulatively, the development of the Seagreen Project, Inch Cape and Neart na Gaoithe represent a significant area of offshore development in the Firth of Forth and Tay region. Seagreen is committed to continuing liaison at an industry level, together with other OWF developers, in order to identify potentially significant cumulative impacts associated with the current planned level of development within the wider region.

15.255. To facilitate this, the FTOWDG was formed to provide a source for collecting AIS shipping data across the area covering the Firth of Forth Round 3 Zone, Inch Cape and Neart na Gaoithe and allow a consortium for consultation on the proposals being developed in the outer Firth of Forth and Tay region. The supporting regional report prepared by FTOWDG can be found in Appendix J2 of ES Volume III.

15.256. The impact of the oil and gas industry in the region is also discussed in the following section.

Cumulative Impact of Seagreen Project with Other Schemes on Commercial Vessels

15.257. Due to the combined presence of the Seagreen Project and Inch Cape, vessels which would have otherwise been deviated to the west of the Seagreen Project are likely to be deviated to the east to avoid transiting through the gap between Project Alpha and Inch Cape (approximately 4.7NM at the narrowest point). This will increase the vessels numbers and traffic density in the area to the east of the Seagreen Project, thus increasing the risk of encounters and collisions.

15.258. Vessels transiting from Firth of Tay Ports (Dundee and Perth) to offshore platforms and Scandinavian ports (Gdansk, Copenhagen and Gothenburg) currently pass through the south of the Seagreen Project and will be impacted by the combined presence of the Seagreen Project and Inch Cape. It is expected that vessels on this route will either alter their course to the south when leaving the River Tay ports and pass between Inch Cape and Neart na Gaoithe or deviate to the north of the Seagreen Project.

15.259. There will also be an increase in the vessel to structure collision risk due to the increased number of structures when multiple OWFs are present.

15.260. There are no oil and gas installations within the Seagreen Project so offshore operations are not expected to be directly impacted. However, support and supply vessels transiting from Firth of Forth and Firth of Tay ports to offshore installations may be deviated by the presence of multiple OWFs, thus increasing their routing distance. Furthermore, jack-up drilling rigs being towed to Dundee for maintenance are likely to keep well clear of the OWFs, which will increase the distance over which they are towed.

15.261. There are currently proposals in place for three biomass plants at port locations within the Firth of Forth and Tay region (located at Dundee, Grangemouth and Rosyth). The Environmental Statements (ES) for the proposed sites state that the majority of fuel will be delivered to the plants by vessels which will increase the number of vessels in port approaches. However, at the time of writing this ES (July 2012) it is not known where vessels will be routing from so further consideration of the potential cumulative effects is not possible.

15.262. The cumulative impact of the Seagreen project and other schemes on commercial vessels arises directly from the presence of structures. It will continue throughout the lifetime of the multiple OWFs in the Firth of Forth and Firth of Tay region because commercial vessel deviations will be required for as long as the structures are in place.

15.263. Due to the reduced sea room available for vessels to deviate when multiple OWFs are considered, the effects on navigational safety that arise from this and the potential increase for vessel to structure collisions, this impact is assessed to be **significant**. Note that the severity of this impact could be increased by the creation of a gap along the boundary between Project Alpha and Project Bravo by changing the pattern of traffic movements in the vicinity of the OWF development in the area.

Cumulative Impact of Seagreen Project with Other Schemes on Fishing Vessels

15.264. Based on the analysis of fishing vessel data, it was identified that the majority of fishing vessels transiting through the Project Alpha and Project Bravo sites were headed in a north-south direction. This means that the presence of Inch Cape and Neart na Gaoithe is not expected to further impact their routes. For those fishing vessels transiting from the east coast of Scotland to fishing grounds in proximity to Project Alpha and Project Bravo, minor deviations may be required when multiple OWFs are built.

15.265. When multiple OWFs are present there will be an increased number of array cables which can be potential snagging hazards for fishing vessels operating in the area.

15.266. There will also be an increased number of displaced commercial vessels that fishing vessels can collide with due to the combined presence of the Seagreen project and other schemes displacing a large number of commercial vessels into reduced sea areas. It is anticipated that fishing vessels displaced into commercial vessel routes or exiting the Project Alpha and Project Bravo Sites into commercial vessel routes will encounter a greater number of vessels, therefore increasing the collision risk.

15.267. The fishing vessel to structure collision risk is also expected to increase given the larger number of structures that are in place when multiple OWFs are considered.

15.268. The cumulative impact of the Seagreen project and other schemes on fishing vessels arises directly from the presence of structures and cables. It will continue throughout the lifetime of the multiple OWFs in the Firth of Forth and Firth of Tay region. The cumulative impacts on the safety of fishing vessels during construction and operation are further discussed in Chapter 14: Commercial Fisheries (see paragraphs 14.350 to 14.355)

15.269. Given the low level of fishing vessel activity in the area, the fact that array cables and export will be suitably buried/ protected and the fact that incidents will be of low severity (i.e. minor vessel damage), this impact is assessed to be **not significant**.

Cumulative Impact of Seagreen Project with Other Schemes on Recreational Vessels

15.270. Based on the analysis of recreational vessel data, it was identified that the majority of recreational vessels intersecting the Project Alpha and Project Bravo sites were headed in a north-south direction. They are expected to continue to pass through Project Alpha and Project Bravo even with the structures in place, which means that the presence of Inch Cape and Neart na Gaoithe is not expected to further impact their routes.

15.271. There will be an increased number of displaced commercial vessels that recreational vessels can collide with due to the combined presence of the Seagreen project and other schemes displacing a large number of commercial vessels into reduced sea areas. It is anticipated that recreational vessels displaced into commercial vessel routes or exiting the Project Alpha and Project Bravo Sites into commercial vessel routes will encounter a greater number of vessels, therefore increasing the collision risk.

15.272. The recreational vessel to structure collision risk is also expected to increase given the larger number of structures that are in place when multiple OWFs are considered.

15.273. The cumulative impact of the Seagreen project and other schemes on recreational vessels arises directly from the presence of structures. It will continue throughout the lifetime of the multiple OWFs in the Firth of Forth and Firth of Tay region.

15.274. Due to the low level of recreational vessel activity and the fact that there is not anticipated to be a high vessel to structure collision risk, this impact is assessed to be **not significant**.

Seagreen Cumulative Impact Including Phases 2 and 3

15.275. Seagreen Phases 2 and 3 encompass five potential OWF sites and connection to the National Grid via three export cables running from the south-western boundary of the Round 3 Zone and coming together at a single landing point near Torness.

15.276. It was agreed with Marine Scotland that a detailed analysis of Phases 2 and 3 will not be included in the cumulative assessment at this stage given the data gaps, further work required and the magnitude of the design assumptions.

Mitigation Measures

15.277. The following section presents mitigation measures which can be implemented for the OWF development to reduce the level of impact:

- promulgation of information and warnings through Notices to Mariners, Kingfisher publications, fisheries liaison, local recreation clubs and marinas and further appropriate media on construction activities, cable installation works and other OWF matters;
- the use of guard vessels where appropriate to aid emergency situations and warn vessels;
- application for and use of safety zones to protect the construction/ decommissioning of the sites;
- use of appropriate means to notify and provide evidence of the infringement of construction safety zones;
- use of vessels that are 'fit for purpose' for the construction activities including marked in accordance with International Regulations for the Prevention of Collisions at Sea (COLREGS) and fitted with an AIS transponder to prevent them becoming a risk factor;

- Aids to Navigation in line with International Association of Lighthouse Authorities (IALA) O-139 (IALA, 2008) and MCA/ NLB Requirements (which will include a system of routine inspection and maintenance of lights and markings);
- additional buoyage if required to assist safe navigation (this would be based on guidance from NLB);
- creation of an Emergency Response Co-operation Plan (ERCoP) with the relevant Maritime Rescue Co-ordination Centre (MRCC) from construction phase onwards, including MCA standards and procedures for WTG shut-down in the event of a search and rescue, counter pollution or salvage incident in or around a OWF;
- monitoring by radar, AIS and Closed Circuit Television (CCTV) or other agreed means;
- fenders/ bumper bollards installed on structures;
- clear notification of works (especially pre charting of cables);
- subsea cables will be buried or trenched where possible to provide protection from dragged and dropped anchors and dropped objects;
- where burial/ trenching is not possible, cables will be protected by other means such as rock dumping and concrete mattresses;
- burial of array and export cables and post-installation surveys on array and export cables to confirm 'over-trawlability' of seabed (see Chapter 14: Commercial Fisheries);
- cable details will also be provided to the United Kingdom Hydrographic Office (UKHO) for inclusion on Admiralty Charts;
- any cables installed within the cable corridor will be notified to Kingfisher Information Services and Cable Awareness (KISCA) for inclusion in cable awareness charts and plotters for the fishing industry;
- consultation with fisheries stakeholders through the proposed regional Fisheries Working Group (see Chapter 14: Commercial Fisheries) to ensure that the cable protection method does not inhibit fishing activities; and
- cable burial and bundling to reduce the effect of electromagnetic interference.

Residual Impacts

15.278. For those impacts described above as being **significant**, the mitigation measures will reduce the level of the impact to **not significant**. All residual impacts are therefore presented as such unless otherwise described in Table 15.6.

Other Impacts

15.279. The following impacts are worth noting as part of the assessment but have not been assessed above due to the fact that they do not present a direct risk to navigational safety:

- increased transit times;
- increased fuel costs; and
- temporary exclusion from certain areas during construction and decommissioning works.

ENVIRONMENTAL STATEMENT LINKAGES

15.280. Table 15.5 presents the inter-relationship between shipping and navigation and the commercial fisheries chapter of the ES.

Table 15.5 ES Linkages

Inter-relationship	Relevant section	Linked chapter
Impacts on fishing vessels.	Refer to Project Alpha, Project Bravo and Transmission Asset Project Impact assessment in Commercial Fish	Chapter 14
Loss of fishing grounds.	Refer to Project Alpha, Project Bravo and Transmission Asset Project Impact assessment in Commercial Fish	Chapter 14
Increased time steaming to fishing grounds.	Refer to Project Alpha, Project Bravo and Transmission Asset Project Impact assessment in Commercial Fish	Chapter 14
Increased fuel costs.	Refer to Project Alpha, Project Bravo and Transmission Asset Project Impact assessment in Commercial Fish	Chapter 14

OUTLINE MONITORING

15.281. From a navigation risk perspective, monitoring will take place through the Seagreen Project's Safety Management System (SMS). The SMS will include an incident/ accident reporting system which will ensure that incidents and near misses are recorded and reviewed to monitor the effectiveness of the risk control measures in place at the site. In addition, any information gained from near misses/ accidents at other OWF sites is likely to be considered with respect to the control measures applied at Project Alpha and Project Bravo.

15.282. During planned and unplanned maintenance works, there will be vessels operating regularly in the OWFs sites which can monitor any third party vessel activity both visually and on radar, although this will not be their primary function.

15.283. CCTV will be installed to enable coverage of the OWF areas from key locations either on the WTGs or the substations. The CCTV will be adjustable for day/ night conditions and allow operators in a central control room to identify vessel names from a distance to facilitate radio communications.

15.284. A Marine Control Centre (MCC) monitoring AIS will be used to monitor and record the movements of vessels around the Seagreen Project as well as company vessels working at the site.

15.285. Any vessel observed to stray into a safety zone will be identified and contacted by a designated member of the crew of the OWF, guard vessel or from the MCC via multi-channel Very High Frequency (VHF) radio, including Digital Selective Calling (DSC), and warned that they have encroached a safety zone.

15.286. Routine operational inspections and maintenance will be carried out on WTGs, foundations, and meteorological masts. Array and export cables will be subject to periodic inspection to ensure they remain buried and/ or protected.

SUMMARY

15.287. Table 15.6 summarises the Shipping and Navigation Chapter by tabulating the impacts, mitigation measures and residual impacts.

Table 15.6 Summary of Shipping and Navigation Impacts

Description of Impact	Impact	Potential Significance before Mitigation	Residual Significance
Construction Phase			
Impact of OWF construction on Commercial Vessels	Route deviations and potential increase in vessel-to-vessel encounters and collision risk for commercial vessels	Not significant	**Not significant**
Impact of OWF construction on Fishing Vessels	Route deviations and potential increase in encounters and collision risk for fishing vessels	Not significant	**Not significant**
Impact of OWF construction on Recreational Vessels	Potential increase in encounters and collision risk for recreational vessels	Not significant	**Not significant**
Impact of Export Cable Installation on Commercial Vessels	Route deviations and potential increase in vessel-to-vessel encounters and collision risk for commercial vessels	Not significant	**Not significant**
Impact of Export Cable Installation on Fishing Vessels	Route deviations and potential increase in encounters and collision risk for fishing vessels See Chapter 14: Commercial Fisheries for further details.	Not significant	**Not significant**
Impact of Export Cable Installation on Recreational Vessels	Route deviations and potential increase in encounters and collision risk for recreational vessels	Not significant	**Not significant**
Impact of Transmission Asset Project Infrastructure Installation on Commercial Vessels	Route deviations and potential increase in vessel-to-vessel encounters and collision risk for commercial vessels	Not significant	**Not significant**
Impact of Transmission Asset Project Infrastructure Installation on Fishing Vessels	Route deviations and potential increase in encounters and collision risk for fishing vessels	Not significant	**Not significant**
Impact of Transmission Asset Project Infrastructure Installation on Recreational Vessels	Potential increase in encounters and collision risk for recreational vessels	Not significant	**Not significant**
Operation Phase			
Impact of OWF on Commercial Vessel Routing	Vessel displacement and route deviations for commercial vessels	Not significant	**Not significant**
Impact of OWF on Commercial Vessel Collision Risk	Potential increase in vessel-to-vessel and vessel-to-structure collisions for commercial vessels	Significant	**Not significant**
Impact of OWF on Fishing Vessels	Potential increase in vessel-to-vessel and vessel-to-structure collisions. See Chapter 14: Commercial Fisheries for further details.	Not significant	**Not significant**

Description of Impact	Impact	Potential Significance before Mitigation	Residual Significance
Impact of OWF on Recreational Vessels	Potential loss of recreational routes and potential increase in vessel-to-vessel and vessel-to-structure collisions for recreational vessels	Not significant	**Not significant**
Impact of OWF on Search and Rescue (SAR) Operations	Increased requirement for search and rescue operations and restricted access to casualties within the Project Alpha and Project Bravo Sites	Significant	**Not significant**
Impact of OWF on Marine Radar Systems	Radar interference within 1.5NM range of WTGs.	Not significant	**Not significant**
Impact of Export Cable on Commercial Vessels	Risk to vessels required to anchor in an emergency situation.	Not significant	**Not significant**
Impact of Export Cable on Fishing Vessels	Gear snagging on export cable resulting in loss of gear or vessel capsizing. See Chapter 14: Commercial Fisheries for further details.	Not significant	**Not significant**
Impact of Export Cable on Recreational Vessels	Risk to recreational vessels anchoring in close proximity to export cable.	Not significant	**Not significant**
Impact of Export Cable on Vessel Navigation	Electromagnetic interference on ship-borne equipment including compasses.	Not significant	**Not significant**
Impact of Transmission Asset Project Infrastructure on Commercial Vessels	Vessel displacement, route deviations and potential increase in vessel-to-vessel and vessel-to-structure collisions.	Not significant	**Not significant**
Impact of Transmission Asset Project Infrastructure on Fishing Vessels	Potential increase in encounters and collision risk for fishing vessels.	Not significant	**Not significant**
Impact of Transmission Asset Project Infrastructure on Recreational Vessels	Potential increase in encounters and collision risk for recreational vessels.	Not significant	**Not significant**
Decommissioning Phase			
The impacts associated with decommissioning the Seagreen Project are anticipated to be similar in nature and extent to those described above for the construction phase.			
Seagreen Project Cumulative Impacts			
Cumulative Impact of Seagreen Project on Commercial Vessel Routing	Vessel displacement and route deviations.	Significant	**Not significant**

Description of Impact	Impact	Potential Significance before Mitigation	Residual Significance
Cumulative Impact of Seagreen Project on Commercial Vessel Collision Risk	Potential increase in vessel to vessel and vessel to structure collision.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	**Not significant**
Cumulative Impact of Seagreen Project on Fishing Vessels	Potential increase in vessel to vessel and vessel to structure collision. See Chapter 14: Commercial Fisheries for further details.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	**Not significant**
Cumulative Impact of Seagreen Project on Recreational Vessels	Potential increase in vessel to vessel and vessel to structure collision and loss of recreational routes.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	**Not significant**
Cumulative Impact of Seagreen Project on Marine Radar Systems	Radar interference within 1.5NM range of WTGs.	Not significant – without a layout gap between Project Alpha and Project Bravo Significant – with a layout gap between Project Alpha and Project Bravo	**Not significant**
Seagreen Project Cumulative Impact with Other Schemes			
Cumulative Impact of Seagreen Project with Other Schemes on Commercial Vessels	Vessel displacement and route deviations and potential increase in collision risk.	Significant	**Not significant**
Cumulative Impact of Seagreen Project with Other Schemes on Fishing Vessels	Potential increase in collision risk with displaced fishing vessels and structures and snagging hazard. See Chapter 14: Commercial Fisheries for further details.	Not significant	**Not significant**
Cumulative Impact of Seagreen Project with Other Schemes on Recreational Vessels	Potential increase in collision risk with displaced recreational vessels and structures.	Not significant	**Not significant**

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