



Navigation Risk Assessment
Beatrice Offshore Transmission
Works
(Technical Note)

Prepared by: Anatec Limited
Presented to: Beatrice Offshore Wind Farm Limited
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Anatec **Aberdeen Office**
Address: 36 Upperkirkgate, Aberdeen, AB10 1BA, Scotland, UK
Tel: 01224 633711
Fax: 0709 2367306
Email: aberdeen@anatec.com

Cambridge Office
16 Ward Way, Witchford, Ely, Cambs, CB6 2JR, UK
01353 661200
0709 2367306
cambs@anatec.com

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1. INTRODUCTION

1.1 Background

The scope of the study is to consider the navigational risks presented by the Beatrice Offshore Wind Farm Offshore Transmission Works (export cable) to shipping and navigation and to assess the risks to the cable from vessels and marine operations in the area.

A chart of the proposed Beatrice Offshore Wind Farm and export cable route corridor is presented in Figure 1.1.

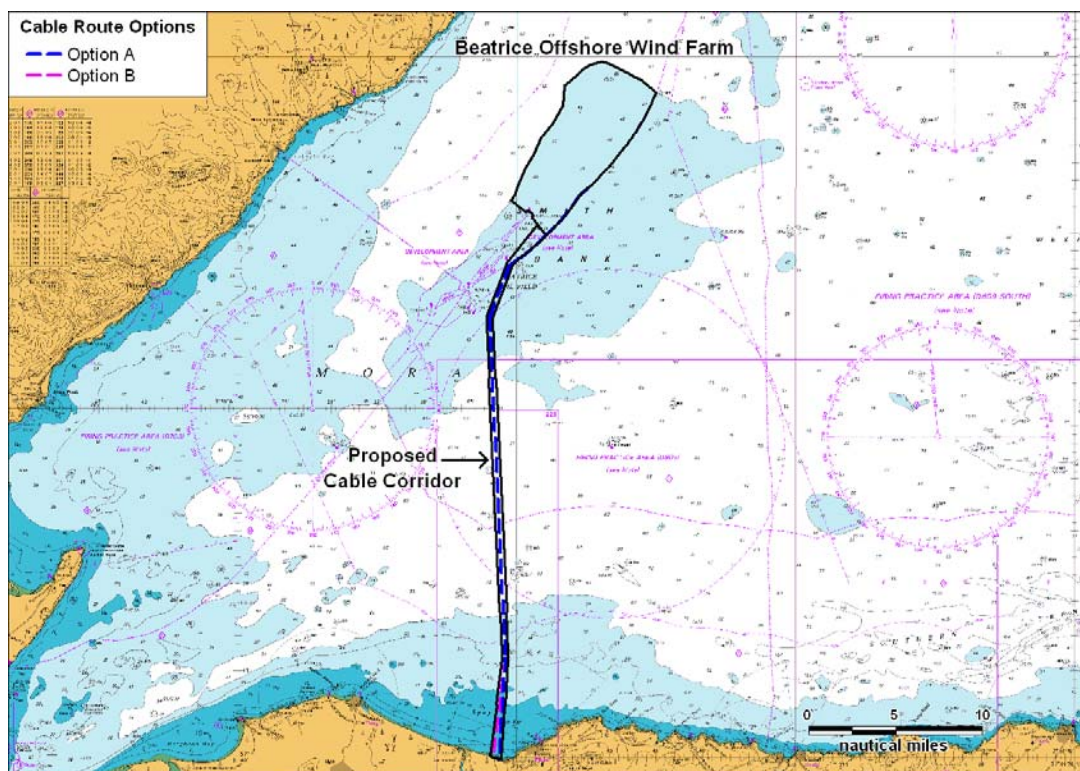


Figure 1.1 Chart Overview of Beatrice Offshore Wind Farm Area and Proposed Export Cable Route

The proposed export cable route corridor follows the same route on the northern section of the export cable for the potential cable routes. There are two land fall locations, (Option A and Option B), which divide from the main cable route approximately 6nm from the Moray coast.

Figure 1.2 presents a detailed chart of the southern section of the cable corridor and land fall Options A and B.

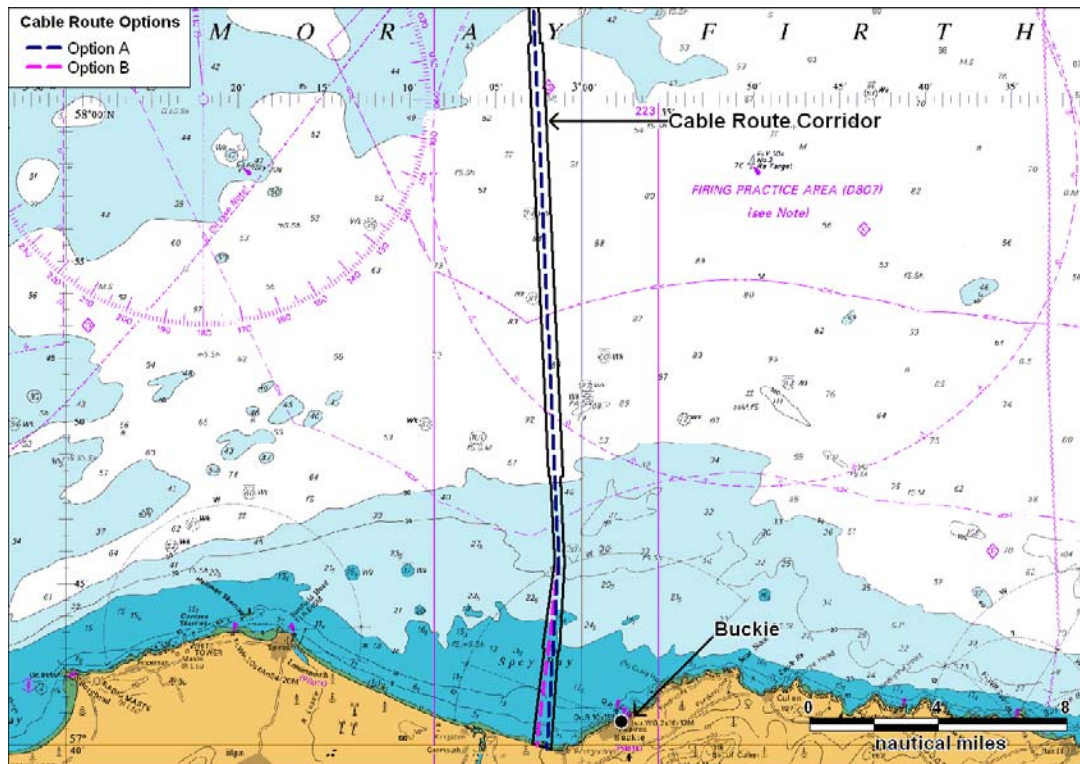


Figure 1.2 Detailed Southern Cable Route Corridor and Land Fall

The proposed export cable route corridor runs for approximately 31nm south from the southern boundary of the wind farm area. Option A and B land fall locations are separated by 0.32nm east and west of the Burn of Tynet.

The report presents information on the proposed cable corridor at the time of writing relative to the baseline marine activity and navigational features for the area.

1.2 Study Scope

The main part of the assessment considers the proposed export cable route associated with the following maritime activities:

- Commercial shipping
- Recreational sailing
- Fishing

In addition to these activities, consideration is given to the following:

- Navigational features, nearby ports/harbours and anchorage areas
- Military exercise areas
- Marine incidents

The potential hazards to the proposed export cable are discussed and risk ranking is carried out to identify the areas which the cable could be at greater risk interaction (i.e. anchor/fishing gear damage).

As part of the hazard review and assessment of impacts, mitigation and monitoring measures are also presented.

1.3 Data Sources

The main data sources used in this assessment are listed below:

- *Chartwell* (2010) and *Gargano* AIS survey data (2010/11);
- Royal Yacht Association (RYA) UK Coastal Atlas of Recreational Boating (Ref. i);
- UK Admiralty Charts (Chart 115);
- Marine Incident Data – Marine Accident and Investigation Branch (MAIB) 2001-10 and Royal National Lifeboat Institute (RNLI) 2001-10);
- Admiralty Sailing Directions (NP 54); and
- Fishing Vessel Monitoring Satellite (VMS) (2009) and Overflight data (2005-09).

1.4 Abbreviations

The following abbreviations are used in this report:

AC	-	Alternating Current
AIS	-	Automatic Identification System
ALB	-	All Weather Lifeboat
AtoN	-	Aid to Navigation
BOWF	-	Beatrice Offshore Wind Farm
BOWL	-	Beatrice Offshore Windfarm Limited
BPI	-	Burial Protection Index
CIADD	-	Cumulative Impact Assessment Discussion Document
CA	-	Cruising Association
DECC	-	Department of Energy and Climate Change
DfT	-	Department for Transport
EIA	-	Environmental Impact Assessment
ERCoP	-	Emergency Response Co-operation Plan
HVDC	-	High Voltage Direct Current
ILB	-	Inshore Lifeboat
ICES	-	International Council for the Exploration of the Seas
IMO	-	International Maritime Organisation
KIS-CA	-	Kingfisher information Services - Chart Awareness
km	-	Kilometre
LAT	-	Lowest Astronomical Tide
MAIB	-	Marine Accident Investigation Branch
MCA	-	Maritime and Coastguard Agency
MEHRA	-	Marine Environmental High Risk Area

MGN	-	Marine Guidance Note
MMO	-	Marine Management Organisation
MORL	-	Moray Offshore Renewables Limited
MFOWDG	-	Moray Firth Offshore Wind Developers Group
MW	-	Mega-Watt
NLB	-	Northern Lighthouse Board
nm	-	Nautical Miles
NRA	-	Navigational Risk Assessment
NtMs	-	Notices to Mariners
OFTO	-	Offshore Transmission Operator
PEXA	-	Practice and Exercise Area
PLN	-	Port Letter Number
RAF	-	Royal Air Force
RNLI	-	Royal National Lifeboat Institution
RO-RO	-	Roll On – Roll Off
RYA	-	Royal Yachting Association
SFI	-	Sea Fisheries Inspectorate
SMS	-	Safety Management System
UKCS	-	United Kingdom Continental Shelf
UKHO	-	United Kingdom Hydrographic Office
VHF	-	Very High Frequency
VMS	-	Vessel Monitoring Service

2. EXISTING ENVIRONMENT

2.1 Introduction

This section presents the following baseline information relating to shipping and navigation adjacent to the Beatrice Offshore Transmission Works:

- Ports and Anchorage
- Navigational Features
- Marine Environmental High Risk Areas

2.2 Ports and Anchorage

A chart of nearby ports, harbours and anchorage areas relative to the proposed export cable corridor extracted from the Admiralty Sailing Directions for the area (Ref. ii) is presented in Figure 2.1.

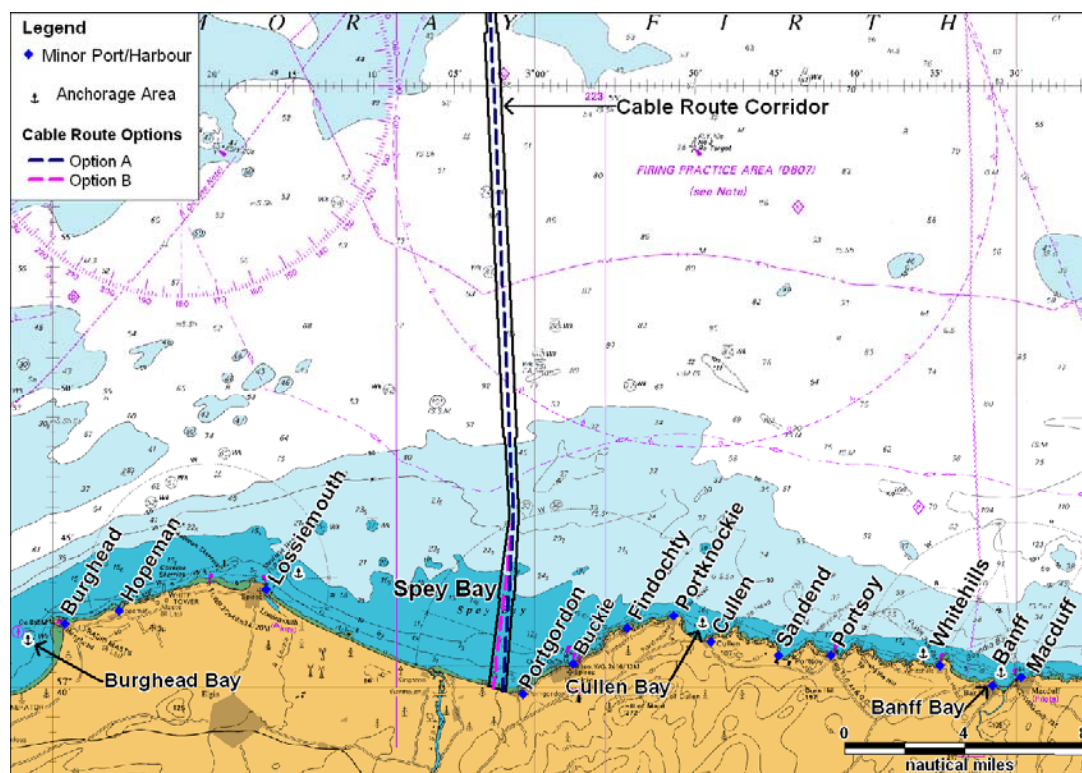


Figure 2.1 Detailed Plot of Moray Firth Ports / Harbours and Anchorages

From east to west the following anchorage areas have been identified from charts and the pilot book for the area (Ref. ii):

- Banff Bay – anchorage in depths of 12m. Smaller vessels can anchor further inshore (dependant on draught), where the ground swell which persists in the outer approaches to the bay is less;
- Whitehills – vessels waiting on tide for entering the harbour can anchor in a water depth of approximately 12m.
- Cullen Bay – anchorage can be found in the outer part of the bay, in depths of 9 to 11m. In addition, Port Long approximately 0.8nm east by south east is a rocky cove with sandy bottom and is used as a temporary refuge by local craft which are unable to make Cullen Harbour during strong winds from the north.
- Spey Bay – anchorage is available anywhere west of the meridian 3 degrees W, but mariners are advised to remain in depths of not less than 10m. In the event of strong north east winds the anchorage should be vacated at once as in these conditions the sea quickly starts to break at a considerable distance offshore.
- Lossiemouth – an outer anchorage can be used when waiting on suitable tides to enter, however mariners are advised to keep Covesea Skerries Light open North of Stotfield Head and to remain in depths not less than 10m. The best berth for larger vessels is in a depth of about 13m, 242 degrees from the harbour entrance and with Halliman Skerries Beacon 2nm west by north west, here the holding is good, but further east the sea bed is rocky and holding is poor. It is noted that vessels anchoring off Lossiemouth should take care to avoid submarine cable outfall, the extremity of which is marked by a special buoy 5 cables (0.5nm) north east of the harbour entrance.
- Burghead Bay – an outer anchorage is recommended approximately 1nm west of the harbour entrance in a depth of 11m (sand). Disused cables in this vicinity are no longer considered a hazard but a submarine outfall pipe, over which depths maybe about 2.5m less than charted on account of rock protection, extends 5 and a half cables (0.55nm) north west from the extremity of Burghead.

An analysis of anchoring activity in the vicinity of the Beatrice Offshore Transmission Works is presented in Section 5.4.

2.3 Navigational Features

A plot of the navigational features relative to the proposed export cable corridor is presented in Figure 2.2.

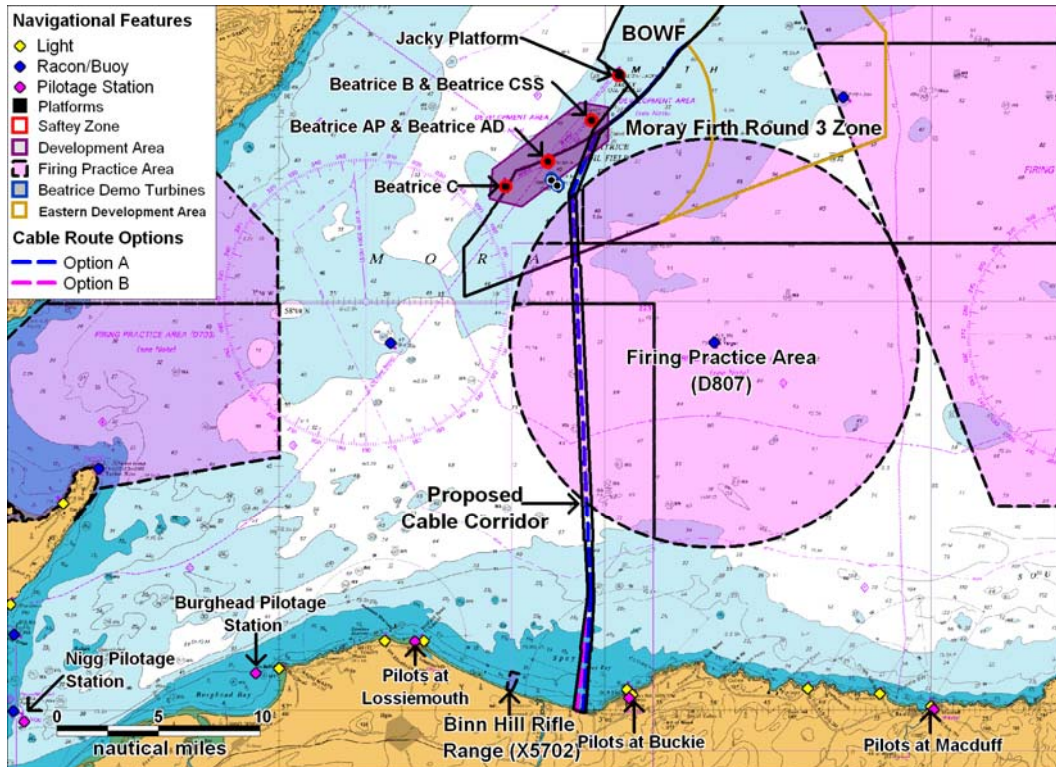


Figure 2.2 Navigational Features relative to Beatrice Offshore Transmission Works

The main navigational features relative to the offshore section of the export cable corridor is the Beatrice Oil Field Development Area* (the cable corridor passes 0.7nm from Beatrice CSS Platform and 0.8nm from the eastern Beatrice Demonstration Turbine). It is noted that drilling may take place in the area dependant on surveys and other drilling activities, i.e. within the Beatrice Development Area and off the Jacky Oil Field.

The closest well to the cable corridor is the oil producing, development well 11/30a-B11Z, located 0.2nm west (inside the Beatrice B and CSS 500m safety zone). There are three exploration wells which were plugged and abandoned, located approximately 0.25nm and 0.8nm west of the cable corridor, within the Beatrice Development Area.

The cable corridor also passes through 6.1nm of the Western Development Area in the Moray Firth Round 3 Zone.

*The chart insert on the Development Area (Admiralty Chart 115) notes surface vessels, subsea craft and divers may be engaged in constructing and servicing installations. Other vessels are strongly advised to keep outside the charted limits of a Development Area.

The proposed export cable corridor also passes 6.3nm west of Radar Target Buoy Number 3 and through the western edge of the Firing Practice Area D807 (used by RAF weapons targeting and training purposes.) The cable route (Option B) is approximately 3nm east of Binn Hill rifle range (small arms) Practice and Exercise Area (PEXA X5702).

2.3.1 Marine Environmental High Risk Areas

Marine Environmental High Risk Area (MEHRAs) have been identified by the UK Government as an area of environmental sensitivity and at high risk of pollution from ships.

There is a MEHRA located within 28nm of proposed export cable corridor land fall (Option A) located at Kinnaird Head (between Rosehearty and Fraserburgh).

It is noted that the Government expects mariners to take note of MEHRAs and either keep well clear or, where this is not practicable, exercise an even higher degree of care than usual when passing nearby.

3. CONSULTATION

3.1 Introduction

As part of the Beatrice Offshore Transmission Works Navigational Risk Assessment (NRA), consultation was carried out with marine stakeholders to ensure the impact assessment gave full account to their views.

It noted that a number of joint meetings were held with both BOWL and Moray Offshore Renewables Ltd (MORL), given the proximity of the Beatrice Offshore Wind Farm and the Moray Round 3 Zone development within the Moray Firth.

The methodology used to gain feedback from marine stakeholders was primarily through consultation meetings with key stakeholders, with hazard workshops taking place in July 2011 with oil and gas operators and commercial shipping stakeholders. A detailed summary of the consultation is provided in the offshore wind farm NRA report (Annex 18A).

3.2 Scoping Opinions

Scoping opinions on the proposed Offshore Transmission Works, relevant to shipping and navigation were received from the following organisations:

- Marine Scotland.
- Marine Coastguard Agency (MCA).
- Northern Lighthouse Board (NLB).
- Royal Yacht Association (RYA).
- Defence Infrastructure Organisation.

A description of the main scoping comments are summarised in the following subsections.

3.2.1 Marine Scotland

- Address possible issues concerning collision risk, navigational safety, effect on small craft navigational and communication equipment.

3.2.2 MCA

- MCA stated that shipping activity appears relatively low; however there are distinct areas where shipping routes intersect the path of the export cable route particularly along the east / west tracks along the southern coast of the Moray Firth. The traffic study and associated NRA should focus on these areas.
- The NRA should reference any electromagnetic effects on ships compasses and navigation.
- Particular attention should be paid to cabling routes and burial depth for which a Burial Protection Index study should be completed and, subject to the traffic volumes, an anchor penetration study may be necessary.

3.2.3 NLB

- NLB noted there would be a requirement for Notice(s) to Mariners, Radio Navigation Warning and publication in appropriate bulletins, stating the nature and timescale of any works carried out in the marine environment relating to this project.
- It may be necessary to mark the landfall site of the export cable routes depending on the location chosen after the OFTO process has been completed. All navigational marking and lighting of the site or its associated marine infrastructure will require the Statutory Sanction of the Northern Lighthouse Board prior to deployment.
- NLB would also welcome and encourage engagement with any other Offshore Renewable Energy Developers in order to work together to minimise the cumulative impact of site development in the vicinity.

3.2.4 RYA

- RYA indicated that it seems unlikely that there would be any significant impact of the proposed works on recreational sailing either in the construction or operational phases.
- Most recreational vessels will pass along the coast and although the small harbours are used by recreational craft, the landfall will presumably not occur at one of them. RYA highlighted a possible opportunity for improving local harbour infrastructure during the construction phase of the project to the benefit of all harbour users.

3.2.5 Defence Infrastructure Organisation

- The Defence Infrastructure Organisation confirmed that they had no objections to the proposed export cable route.
- However, they noted that the cable route runs through an area which is used by the Navy for Joint Warrior Exercises. Therefore, they would be grateful if information could be provided on the dates BOWL is planning to lay the cables, when available.

4. MARITIME INCIDENTS

4.1 Introduction

This section reviews maritime incidents that have occurred in the vicinity of the proposed Beatrice Offshore Transmission Works in the last ten years.

The analysis is intended to provide a general indication as to whether the area of the proposed cable route is currently low or high risk in terms of maritime incidents. Data from the following sources has been analysed:

- Marine Accident Investigation Branch (MAIB)
- Royal National Lifeboat Institution (RNLI)

It is noted that the same incident may be recorded by both sources.

4.2 MAIB

All UK-flagged commercial vessels are required to report accidents to the MAIB. Non-UK flagged vessels do not have to report unless they are within a UK port/harbour or within UK 12 mile territorial waters and carrying passengers to or from a UK port (including those in inland waterways). However, the MAIB will record details of significant accidents of which they are notified by bodies such as the Coastguard, or by monitoring news and other information sources for relevant accidents. The Maritime and Coastguard Agency, harbour authorities and inland waterway authorities also have a duty to report accidents to MAIB.

The locations¹ of accidents, injuries and hazardous incidents reported to MAIB within 10nm of Beatrice Offshore Transmission Works between January 2001 and December 2010 are presented in Figure 4.1, colour-coded by type.

¹ MAIB aim for 97% accuracy in reporting the locations of incidents.

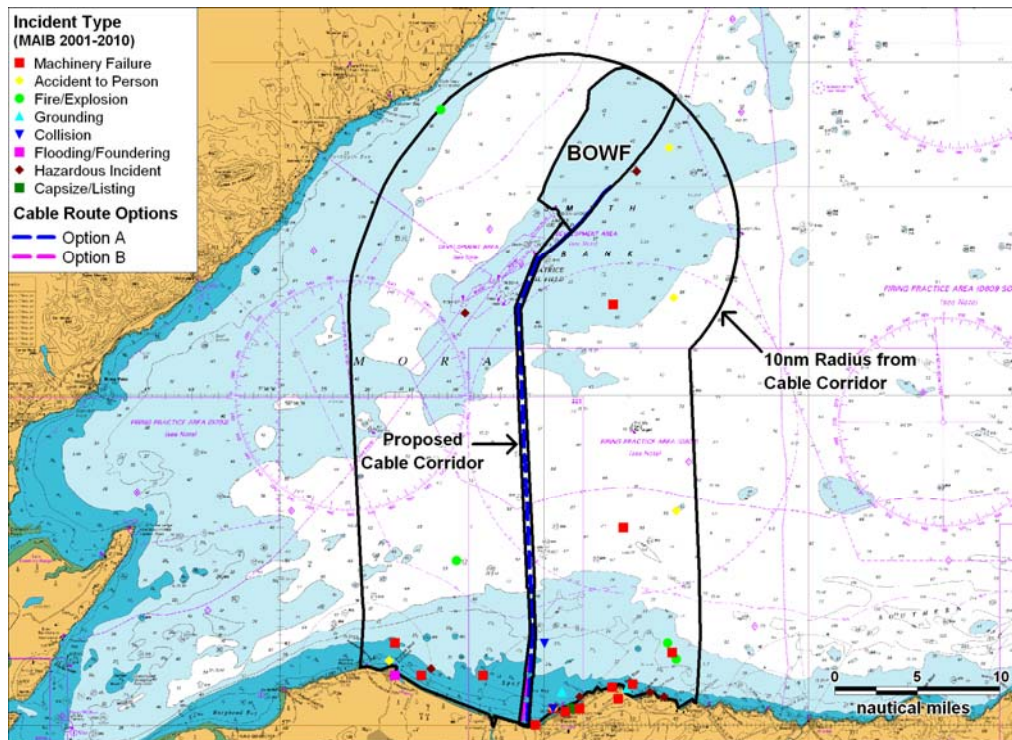


Figure 4.1 MAIB Incident Locations by Type within 10nm of Beatrice Offshore Transmission Works

A total of 38 incidents were reported within 10nm of the cable corridor, corresponding to an average of 4 per year. The majority of the incidents occurred in the coastal area between Lossiemouth and Portsoy. The distribution by incident type is presented in Figure 4.2.

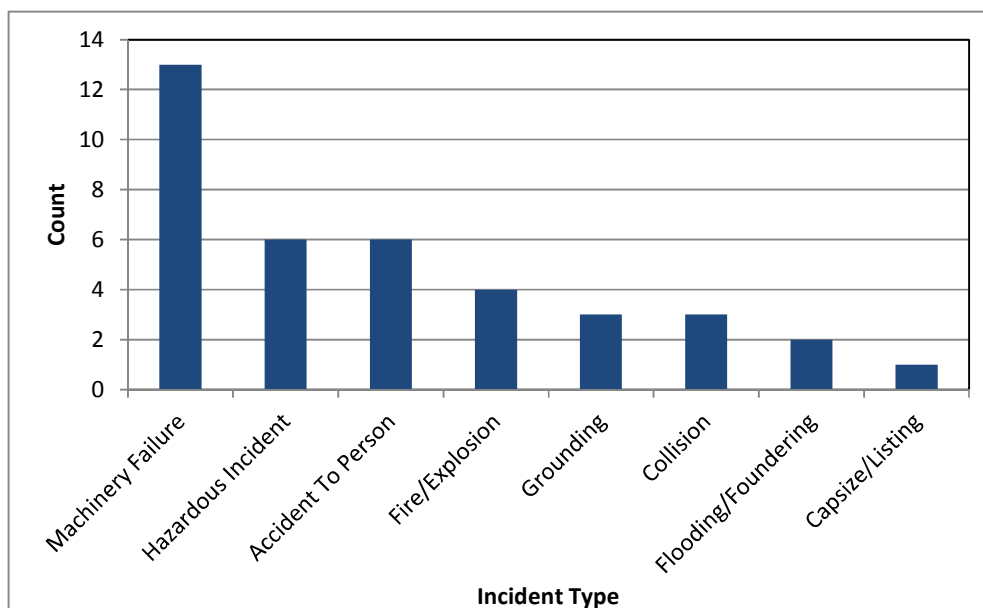


Figure 4.2 MAIB Incidents by Type within 10nm of Cable Corridor (2001-2010)

The most common incident type recorded within 10nm of the cable corridor was machinery failure, representing 34% of all incidents over the ten year period.

There were no incidents reported within the proposed export cable corridor. The closest incident relative to the cable route was a machinery failure approximately 0.5nm from the Option A cable on 10th September 2005. The incident involved a 5m fibre glass fishing vessel which got a submerged rope caught around propeller, an emergency Call was made by member of public and the vessel was towed into port by the Buckie All Weather Lifeboat (ALB).

The second closest incident involved a collision between a general cargo ship (90m) and a fishing beam trawler (12m) on 13th September 2008 in clear visibility and broad daylight approximately 0.8nm west of the Option A cable route. The fishing vessel had gear deployed at the time and the cargo ship was on passage at full speed. The merchant vessel tried to take evasive action to avoid the fishing trawler when it was sighted, however both vessels collided sustaining minor damage.

In addition, two collision incidents were recorded within Buckie harbour on the 21st April 2008 (between a tug manoeuvring in the harbour a small wooden hulled vessel which was moored and sustained minor damage) and 25th February 2007 (between a moored dive support vessel and trawler which was departing its mooring).

4.3 RNLI

Data on RNLI lifeboat responses within 10nm of the Beatrice Offshore Transmission Works in the ten-year period between 2001 and 2010 have been analysed. A total of 145 launches were recorded for 146 incidents by the RNLI (excluding hoaxes and false alarms).

Figure 4.3 presents the geographical location of incidents colour-coded by casualty type. It can be seen that the vast majority occurred near the coast (west of Lossiemouth to Portsoy), with relatively few further out to sea.

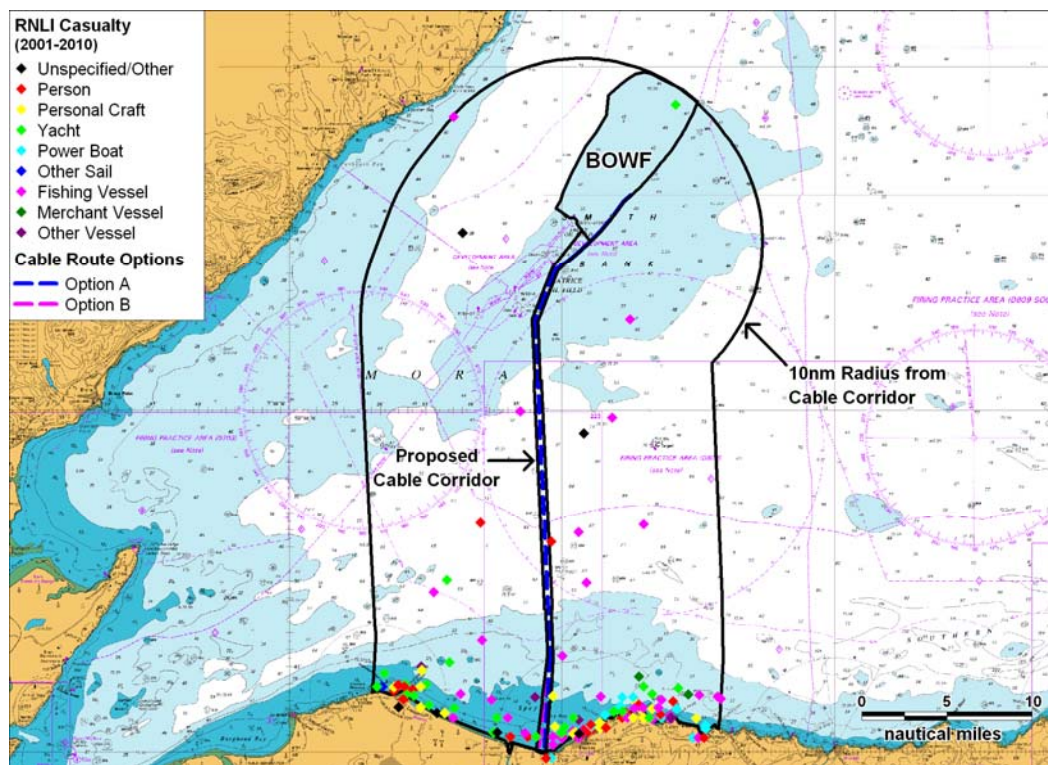


Figure 4.3 RNLI Incidents by Casualty Type within 10nm of Beatrice Offshore Transmission Works

No incidents were recorded within the cable corridor over the 10 year period analysed. The three closest incidents are summarised below:

- A failed search for missing person (presumed drowned) on 25th October 2004 by Buckie All-Weather Lifeboat (ALB) approximately 0.16nm east of the shared cable corridor (11.5nm north by north west of Buckie).
- Buckie ALB gave assistance in a search for an abandoned canoe 25th March 2007, observed 0.3nm east of cable route Option A.
- A machinery failure occurred on a yacht on 24th June 2007, Buckie ALB gave assistance approximately 0.2nm west of cable route Option B.

The overall distribution by casualty type is summarised in Figure 4.4.

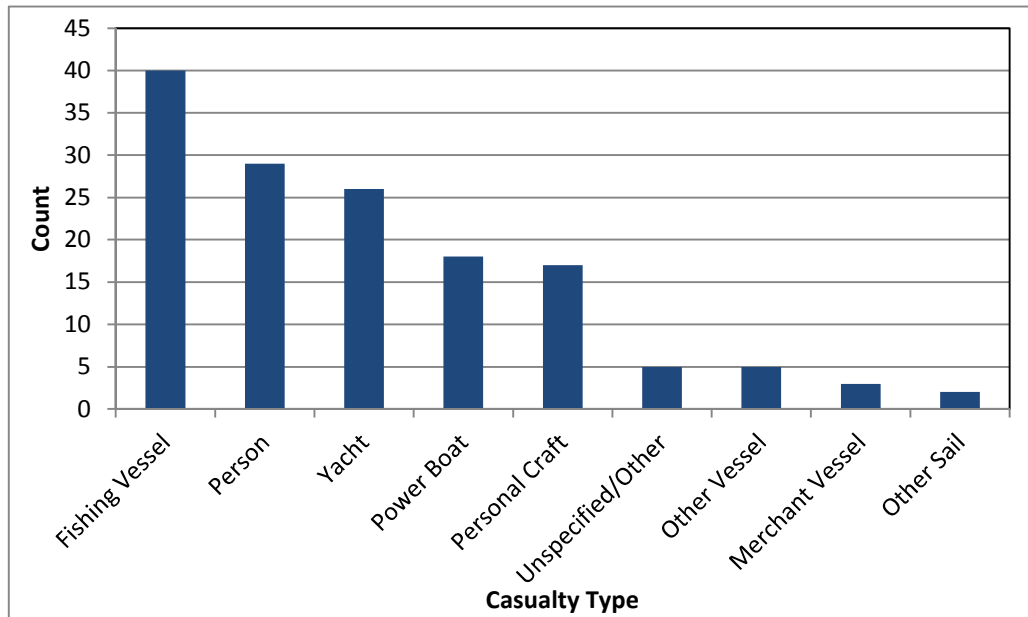


Figure 4.4 RNLi Incidents by Casualty Type within 10nm of Cable Corridor (2001-2010)

Fishing (28%), person (20%) and yacht (18%) were the most common casualty types involved. The remainder of casualties were generally made up of inshore vessels, i.e. power boats (12%) and personal craft/canoes (12%).

A chart of the incidents by cause is presented in Figure 4.5.

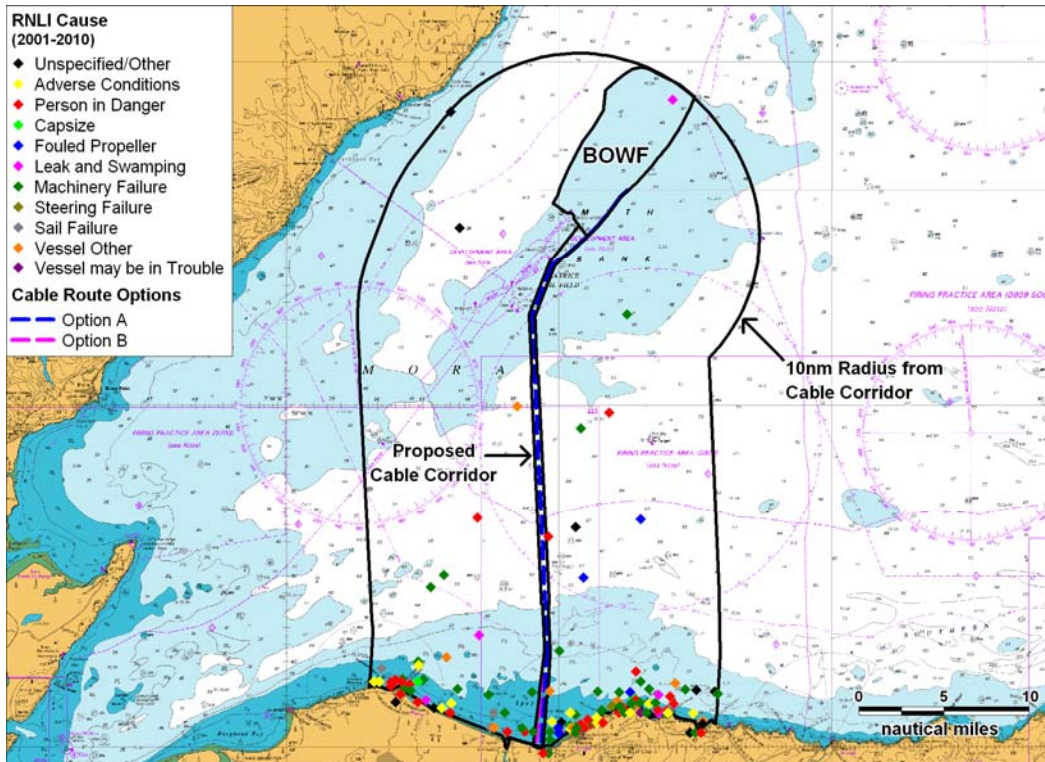


Figure 4.5 RNLI Incidents by Cause within 10nm of Beatrice Offshore Transmission Works

The main reported causes were machinery failure (35%) and person in danger (29%). The annual rate of incidents in the past ten years is summarised in Figure 4.6.

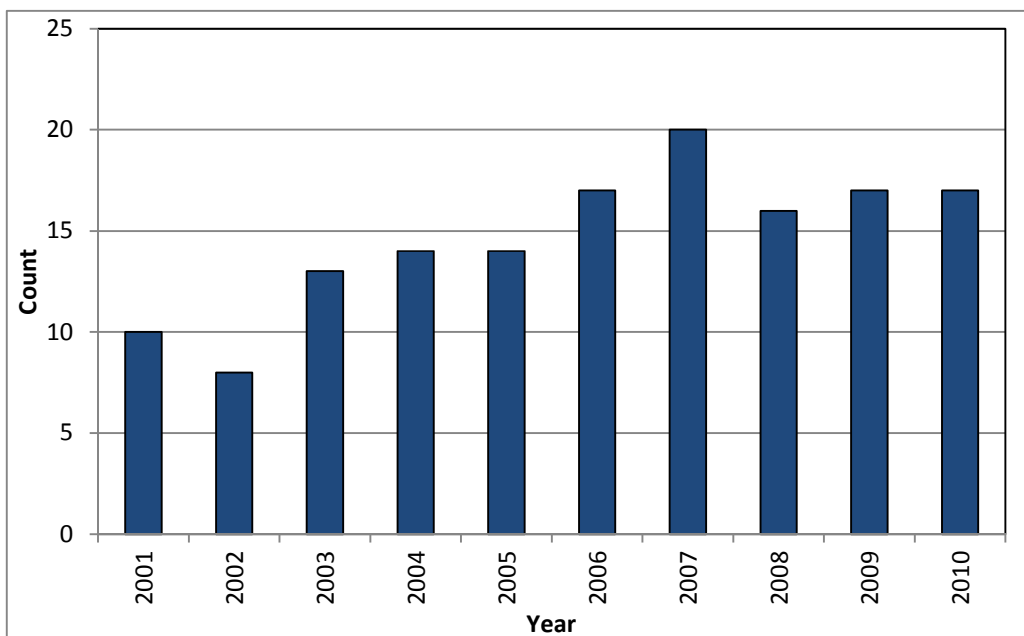


Figure 4.6 RNLI Incidents by Year within 10nm of Cable Corridor (2001-2010)

There was an average of 15 incidents per year for the 10 years analysed, and the year with the most incidents was 2007.

There are two types of RNLI lifeboats that can respond to incidents (ALB = All Weather Lifeboat and ILB = Inshore Lifeboat). From the ten year period of RNLI data analysed (2001-2010), it was noted that Buckie ALB (stationed 2nm east of Option A cable route) responded to the vast majority of incidents (92%) within 10nm of the proposed export cable route.

4.4 Conclusions

Based on the review of incidents, it can be seen that the Beatrice Offshore Transmission Works and its immediate vicinity has experienced a relatively low rate of accidents in recent years, especially over 5nm from the coast and land fall options.

Most incidents in the area have occurred within 3nm of the coastline between Lossiemouth and Portsoy. However, it was considered that both Option A and B land fall options do not pass through a ‘hot-spot’ or high density area of marine incidents.

5. MARITIME TRAFFIC SURVEYS

5.1 Introduction

This section summarises the results of the maritime traffic surveys carried out in the Moray Firth relative to the Beatrice Offshore Transmission Works, using a combination of shore-based AIS and AIS data collected from two survey vessels that operated within the Moray Firth during summer 2010 and winter 2010/11.

5.2 Survey Details

Two survey vessels recorded shipping data for Beatrice Offshore Transmission Works while working in the Moray Firth. The first survey took place from 1st April to 31st July 2010 from *Chartwell* with a winter survey from the geotechnical vessel *Gargano* over two periods (2nd November to 13th December 2010) and (31st December 2010 to 9th January 2011). Full details of the *Gargano* survey are presented in the separate report prepared by Anatec (Ref. iii).

Given the size of the Moray Firth, AIS coverage occasionally dropped-off at the extremities of the area during survey operations, etc., therefore Anatec supplemented the *Chartwell* and *Gargano* survey data with coastal based AIS to improve and provide comprehensive AIS coverage for the entire area.

5.3 Survey Plots

For the cable route assessment two datasets taking into account seasonal fluctuations in shipping were selected with 28 days from the winter data (3rd November 2010 to 2nd January 2011) and 28 days from the summer data (4th to 31st of July 2010), presented in the following sections. Non-routine vessels including survey ships were removed from the data set to focus on passing shipping.

Charts of the vessels recorded on AIS during the two survey periods, colour-coded by ship type, are presented in Figure 5.1 and Figure 5.2.

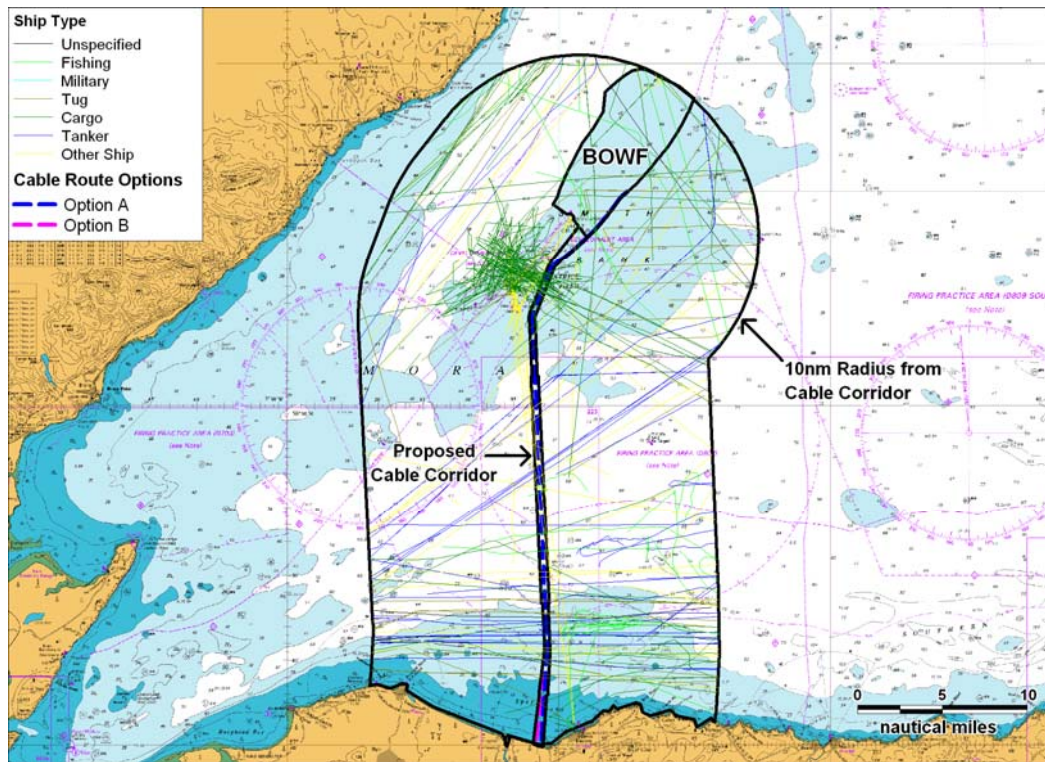


Figure 5.1 *Gargano* November 2010 to January 2011 Survey (28 Days AIS tracks)

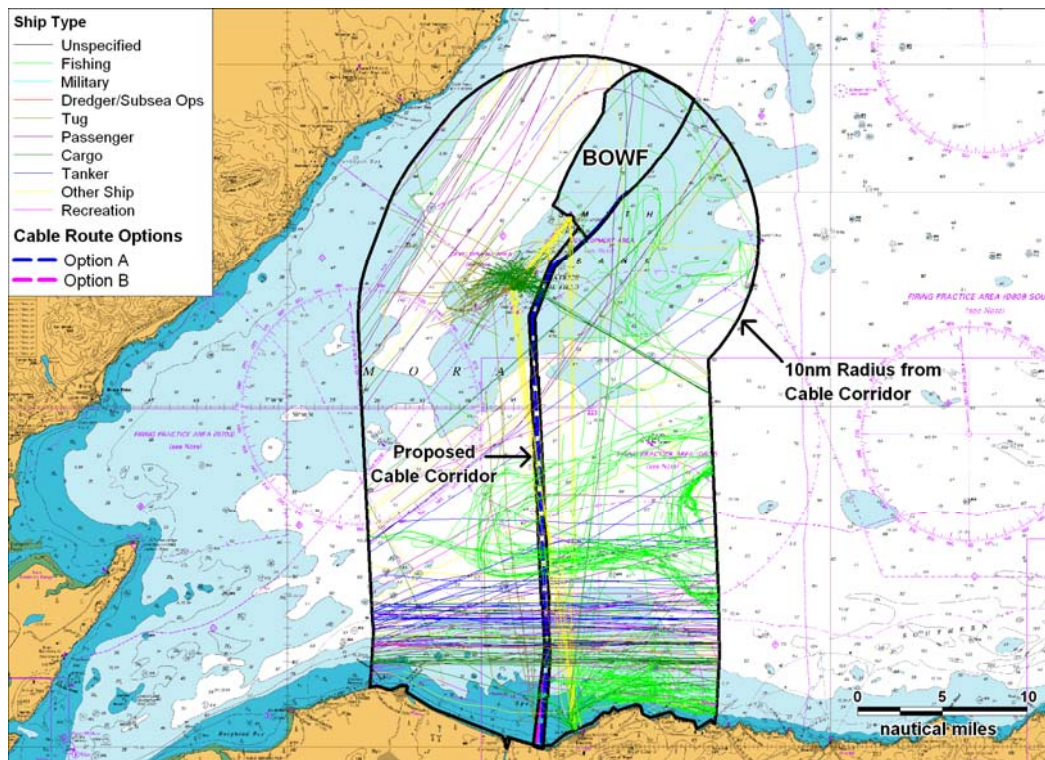


Figure 5.2 *Chartwell* 4th to 31st July 2010 Survey (28 Days AIS tracks)

The number of unique vessels within 10nm of the Beatrice Offshore Transmission Works averaged approximately 9 vessels per day.

As can be observed from the shipping plots, the majority of vessel tracks were associated with vessels heading east/west into Inverness and Cromarty Firth, with the mean route intersecting the cable corridor for approximately 3-4nm. In general, commercial shipping in this area keeps at least 1.3-2.5nm north of the Moray and Aberdeenshire coast.

The breakdown of ships by type for vessels within 10nm of the Transmission Works is presented in Figure 5.3. This considers all vessels recorded during the two survey periods (56 days in total).

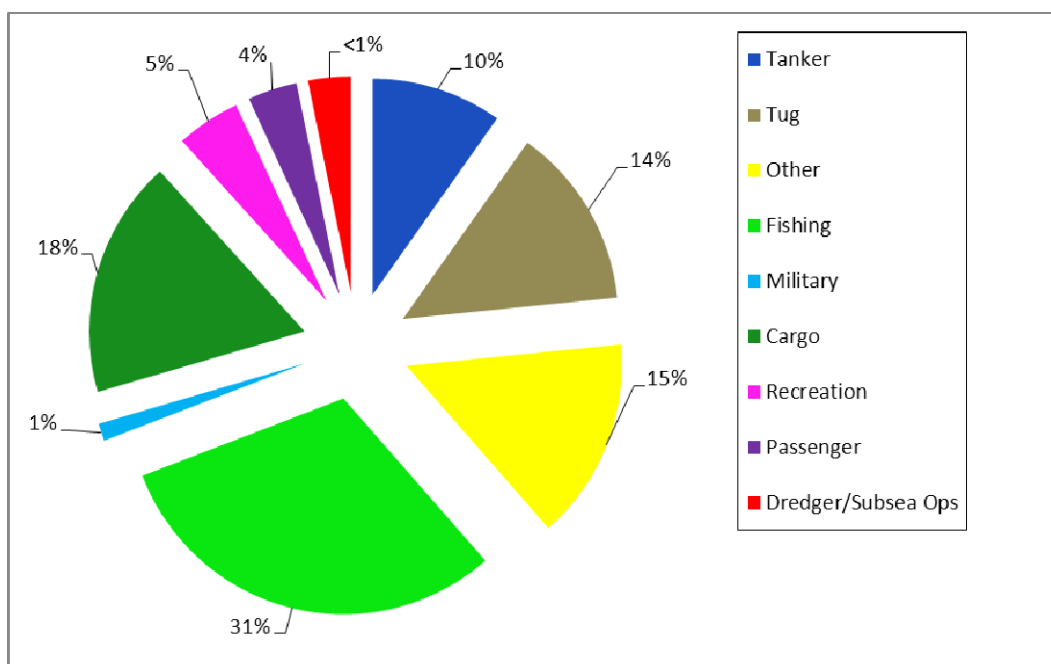


Figure 5.3 Vessel Types identified during the Combined Surveys

The most common vessel type recorded during the two surveys was fishing vessels (31%), cargo vessels (18%) and ‘other ships’ (15%).

A portion of cargo, tugs and other vessels were offshore oil and gas industry related, i.e. supporting the Beatrice and Jacky Fields and other North Sea operations. Offshore vessels can also be recorded off Spey Bay whilst ‘waiting on orders’ or for the maintenance of mobile drilling units which can moor in the area or dock in Cromarty Firth. A detailed analysis of anchored vessels is provided in the following section.

5.4 Anchored Vessels

Anchoring activity recorded during the combined surveys is presented in Figure 5.4, with a detailed chart by ship type including vessel labels in Figure 5.5.

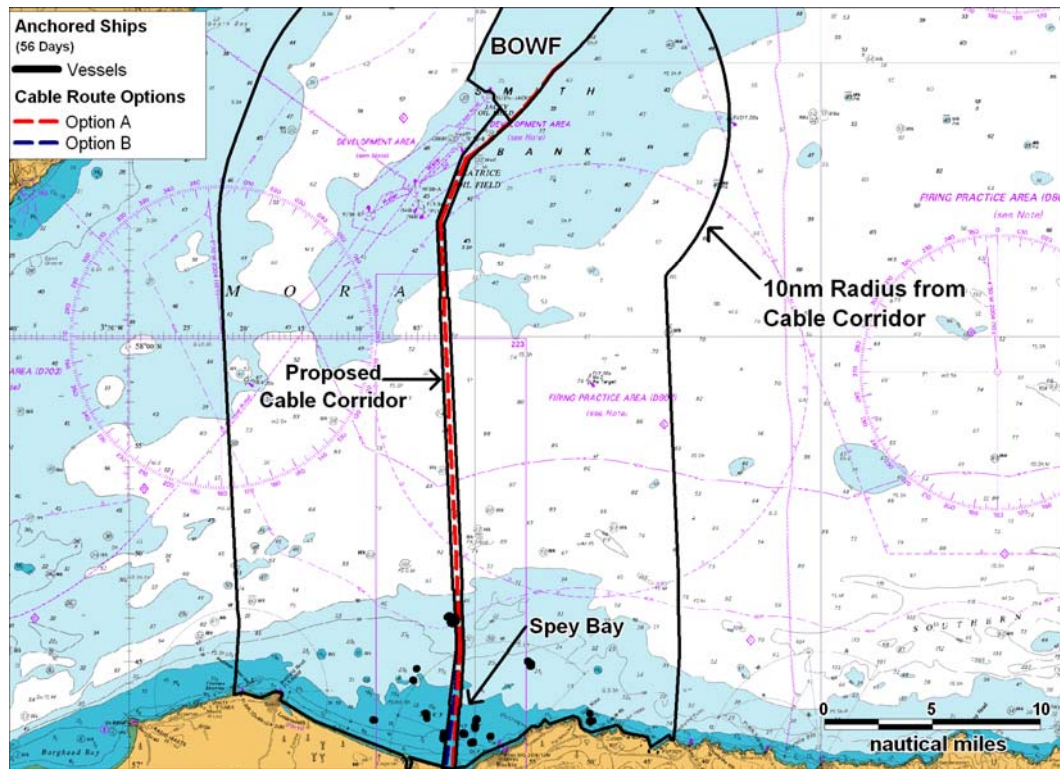


Figure 5.4 All Anchored Vessels during Surveys (56 Days)

It can be observed that a number of vessels were recorded at anchor within 3nm of the cable route Options A and B in Spey Bay during the combined surveys (Figure 5.5 presents a more detailed plot).

Offshore drilling rigs are also recorded mooring in the area whilst waiting for orders and/or prior to mooring in the Cromarty Firth for maintenance. Further data during spring/summer 2010 was analysed and three semi-submersible drilling rigs were recorded moored within 10nm of the proposed export cable corridor, as described below:

- *John Shaw* was recorded 5.5nm north of Lossiemouth and 6.3nm west of the cable corridor.
- *Ocean Nomad* was recorded 6.8nm west of the export cable corridor.
- *Borgsten Dolphin* was recorded approximately 10nm west of the cable corridor (7nm north west of Lossiemouth).

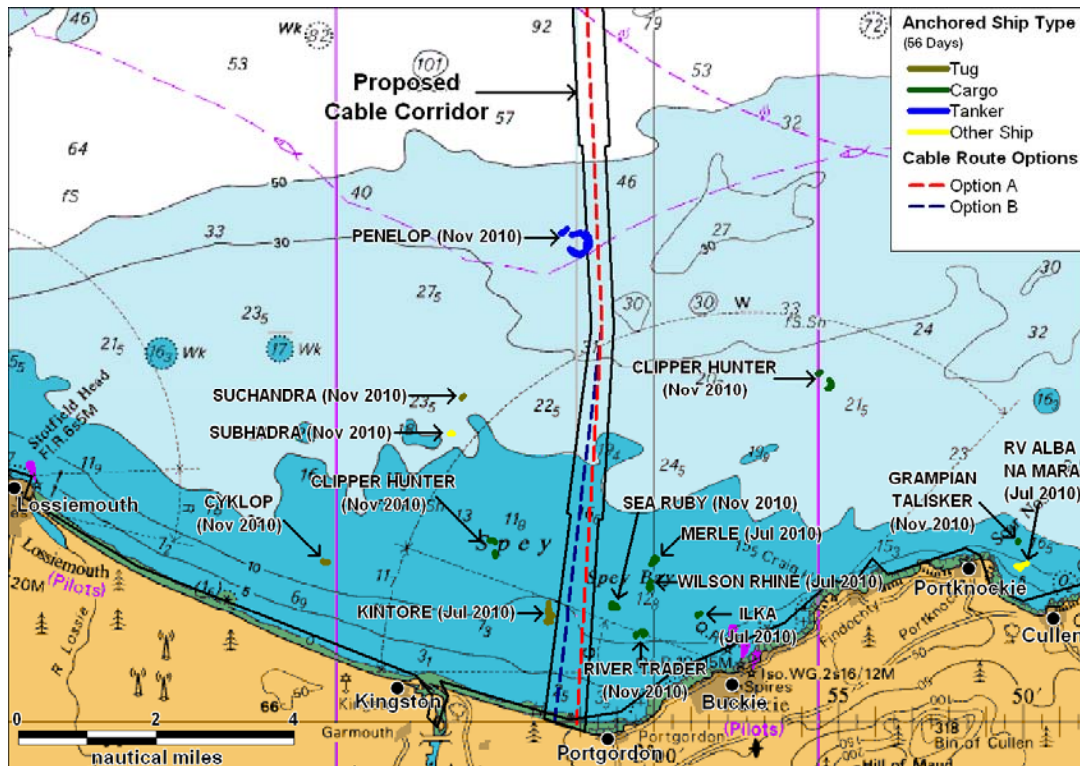


Figure 5.5 Spey Bay Anchored Vessels during Surveys (56 days of surveying)

Within approximately 6nm of the proposed export cable routes in Spey Bay/off Buckie, there were 14 vessels recorded at anchor (the majority were small to medium sized cargo vessels (55%)). An average of one vessel every two days was recorded anchoring in the area, with approximately half the vessels recorded during the summer and half recorded during the winter surveys.

A summary of the three closest anchored vessels recorded during the two surveys is provided below:

- The crude oil tanker *Penlop* (255m in length, broadcasting a draught of 8.6m) was recorded anchored in the western edge of cable corridor. This vessel was anchored approximately 6.7nm north of the cable land fall options for 5 days during November 2010.
- The second closest vessel recorded at anchor was the tug/survey vessel *Kintore* (29m in length, broadcasting a draught of 3.5m) recorded for 4 days during July 2010, approximately 130m west of the cable corridor and 1.3nm from shore.
- The third closest anchored vessel was the general cargo vessel *Sea Ruby* (78m in length, broadcasting a draught of 4m) 470m east of the cable corridor and 1.7nm north of Portgordon.

6. RECREATIONAL VESSEL ACTIVITY

6.1 Introduction

This section reviews recreational vessel activity relative to the Beatrice Offshore Transmission Works based on survey data and information published by the Royal Yachting Association (RYA).

6.2 Survey Data

The following chart presents the AIS recreational vessel tracks recorded from the combined surveys relative to the proposed export cable corridor. It is noted that no recreational vessels were recorded during the winter survey; therefore Figure 6.1 presents 28 days of tracks from summer 2010.

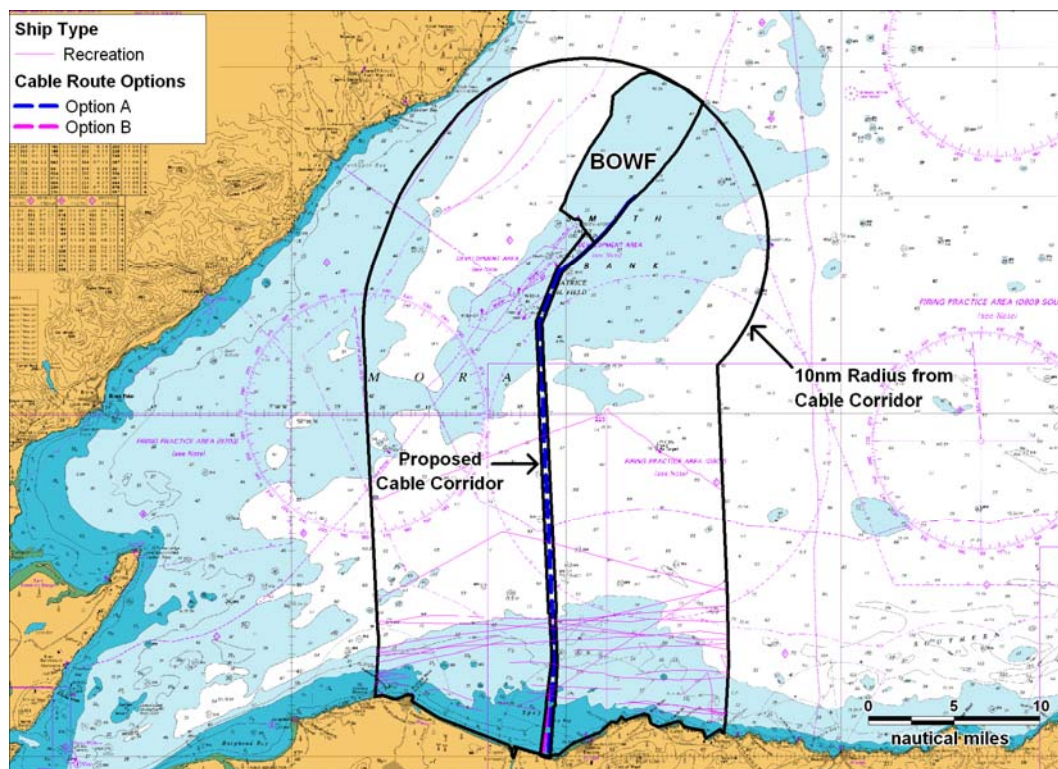


Figure 6.1 Recreation Vessels Recorded during Survey (28 days)

It can be observed that a number of AIS recreation sailing vessels were recorded headed along the Moray and Aberdeenshire coast intersecting the cable route north of Spey Bay.

6.3 RYA Data

6.3.1 Introduction

The Royal Yacht Association (RYA), supported by the Cruising Association (CA), who represent the interests of cruising sailors and motor-boaters worldwide, have identified recreational cruising routes, general sailing and racing areas for UK waters. This work was based on extensive consultation and qualitative data collection from RYA and CA members, through the organisations' specialist and regional committees and through the RYA affiliated clubs. The consultation was also sent to berth holder associations and marinas. The results of this work were published in *Sharing The Wind* (Ref. iv) and updated GIS layers published in the *Coastal Atlas* (Ref. i). Data from 2010 has been used for this study.

The reports note that recreational boating, both under sail and power is highly seasonal and highly diurnal. The division of recreational craft routes into Heavy, Medium and Light Use is therefore based on the following classification:

- *Heavy Recreational Routes:* - Very popular routes on which a minimum of six or more recreational vessels will probably be seen at all times during summer daylight hours. These also include the entrances to harbours, anchorages and places of refuge.
- *Medium Recreational Routes:* - Popular routes on which some recreational craft will be seen at most times during summer daylight hours.
- *Light Recreational Routes:* - Routes known to be in common use but which do not qualify for medium or heavy classification.

6.3.2 Moray Firth/Spey Bay Recreational Data

A chart of the recreational sailing activity and facilities relative to the Beatrice Offshore Transmission Works is presented in Figure 6.2.

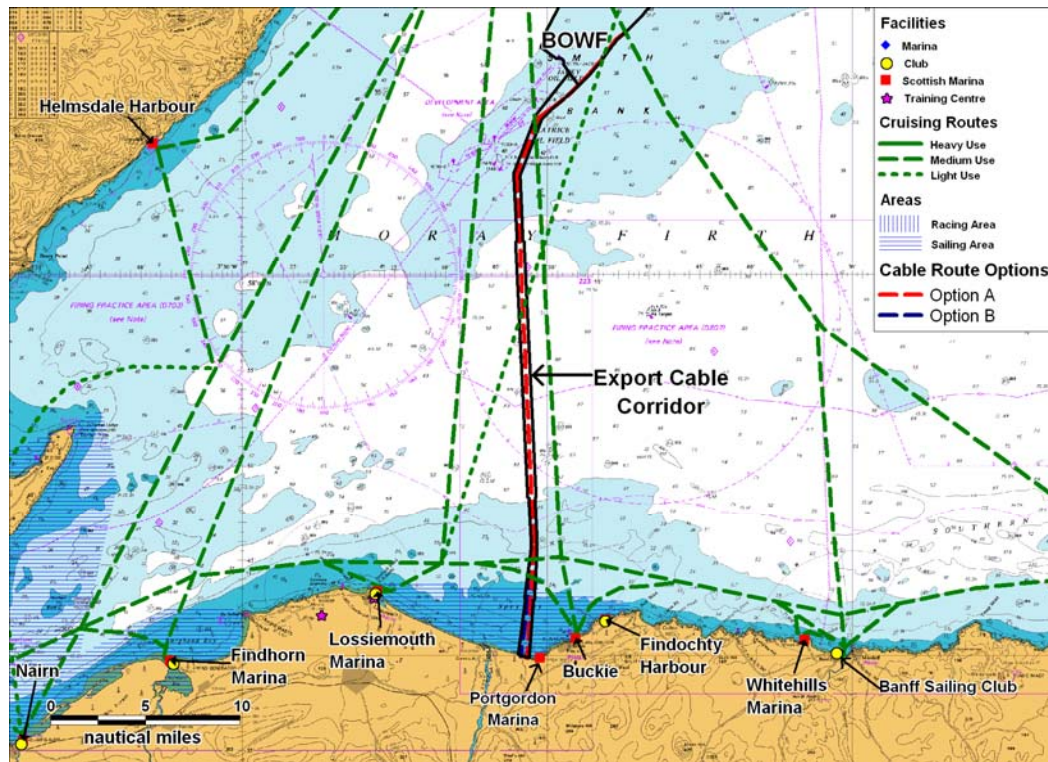


Figure 6.2 Recreational Information relative to the Proposed Cable Corridor

In terms of facilities, there are a number clubs, training centres and marinas for recreational vessels located on the coast around Moray, Aberdeenshire and Caithness/Sutherland. There are also a range of facilities located at Inverness which is popular for vessels passing through the Caledonian Canal.

The nearest marina to the proposed cable route is located at Portgordon approximately 1km to the east and the nearest clubs are located at Lossiemouth and Findochty.

There are three medium-use routes that pass over the proposed export cable route, from Wick to Peterhead, Buckie, and Lossiemouth. A light-use route between the Northern Isles and Moray Firth (Lossiemouth) also intersects the cable corridor.

It is also noted that Spey Bay is a ‘General Sailing Area’ and extends 3.7nm from the cable route land fall options. RYA define a sailing area as an area in extensive use for general day-sailing by all types of recreational craft but particularly smaller craft such as small cruisers, day-boats, dinghies, sailboards and personal watercraft. Such craft will not normally be undertaking point-to-point passages but will be on out and return activities and may appear to be sailing in random directions as they take advantage of wind and tide to make progress.

7. FISHING VESSEL ACTIVITY

7.1 Introduction

This section reviews the fishing vessel activity relative to the Beatrice Offshore Transmission Works based on survey data, surveillance sightings and satellite monitoring data.

7.2 Commercial Fisheries Assessment

A detailed study of the fishing activity in the vicinity of the Beatrice Offshore Wind Farm and export cable works has been performed as part of the Environmental Impact Assessment (EIA) (Ref. v).

7.3 Survey Data

Figure 7.1 presents the AIS fishing vessel tracks recorded relative to the proposed export cable corridor.

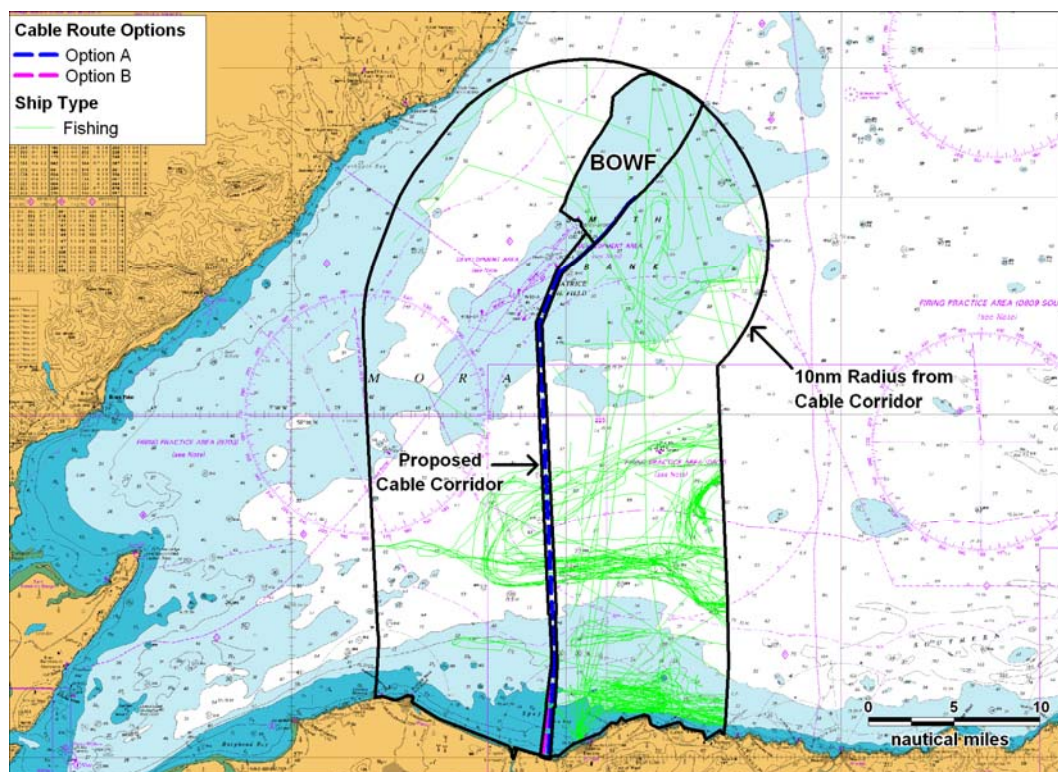


Figure 7.1 Fishing Vessels Recorded during Survey (56 Days)

It can be observed that the AIS fishing vessel tracks were recorded headed in/out of the fishing port of Buckie and with fishing tracks intersecting the proposed cable route approximately 10nm north of land fall options.

7.4 Surveillance Data Overview

7.4.1 Geographical Division

Fisheries statistics in the UK are reported by ICES statistical Rectangles and Subsquares. The Beatrice Offshore Transmission Works are located within ICES Rectangle (44E6, 45E6 and 45E7), Subsquares 44E6/2, 44E6/4, 45E6/4 and 45E7/3.

7.4.2 Sightings Data

Data on fishing vessel sightings were obtained from Marine Management Organisation (MMO). The over-flight data provides an insight into the fishing areas exploited by vessels under 15m overall length who are not subject to satellite monitoring, as well as vessels under 10m overall length who neither record fishing areas/catches (log sheets) or have satellite information.

The Sea Fisheries Inspectorate (SFI) monitor the fishing industry's compliance with UK, EU and international fisheries laws through the deployment of patrol vessels, surveillance aircraft and the sea fisheries inspectorate. Each patrol logs the positions and details of all fishing vessels (UK and non-UK) within the Rectangle being patrolled. All vessels are logged, irrespective of size, provided they can be identified by their Port Letter Number (PLN).

Data was obtained for the five-year period (2005 to 2009). Section 7.5 presents the sightings data analysis.

7.4.3 Satellite Data

The Marine Management Organisation (MMO), formerly the Marine and Fisheries Agency, operates a satellite vessel monitoring system from its Fisheries Monitoring Centre in London. The vessel monitoring system is used, as part of the sea fisheries enforcement programme, to track the positions of fishing vessels in UK waters. It is also used to track all UK registered fishing vessels globally. Under European Union legislation, VMS is a legal requirement for vessels in excess of 15m.

Vessel position reports are received approximately every 2 hours unless a vessel has a terminal on board which cannot be polled and then it must report once per hour. The data covers all EC countries within British Fisheries Limits and certain Third Countries, e.g., Norway and Faeroes. Vessels used exclusively for aquaculture and operating exclusively within baselines are exempt.

Satellite monitoring data from 2009 was analysed (including UK and non-UK fishing vessels).

7.5 Sightings Data

7.5.1 Sightings per Patrol

The numbers of fishing vessel sightings, surveillance patrols and hence average sightings per patrol within each ICES Subsquare encompassing the cable corridor in the five-year period 2005-09 are presented in Table 7.1.

Table 7.1 Average sightings per patrol (2005-09)

ICES Subsquare	Sightings	Patrols	Sightings per Patrol
44E6/2	287	245	1.2
45E7/3	103	253	0.4
44E6/4	54	169	0.3
45E6/4	86	219	0.4

Therefore, the Subsquares had approximately one fishing vessel sighting every two patrols. Subsquare 44E6/2 had a higher average sighting per patrol, as this inshore area is likely to have an increased number of smaller vessels operating. The sightings data were imported into a GIS for mapping and analysis.

Within the proposed export cable corridor, a total of 14 fishing vessels were sighted, with the vast majority outside the cable corridor (99%).

7.5.2 Sightings Nationality Analysis

All of the fishing vessel sightings within ICES rectangles adjacent to the Beatrice Offshore Transmission Works were UK-registered.

7.5.3 Sightings Gear Analysis

The fishing vessel sightings colour-coded by gear type are presented in Figure 7.2.

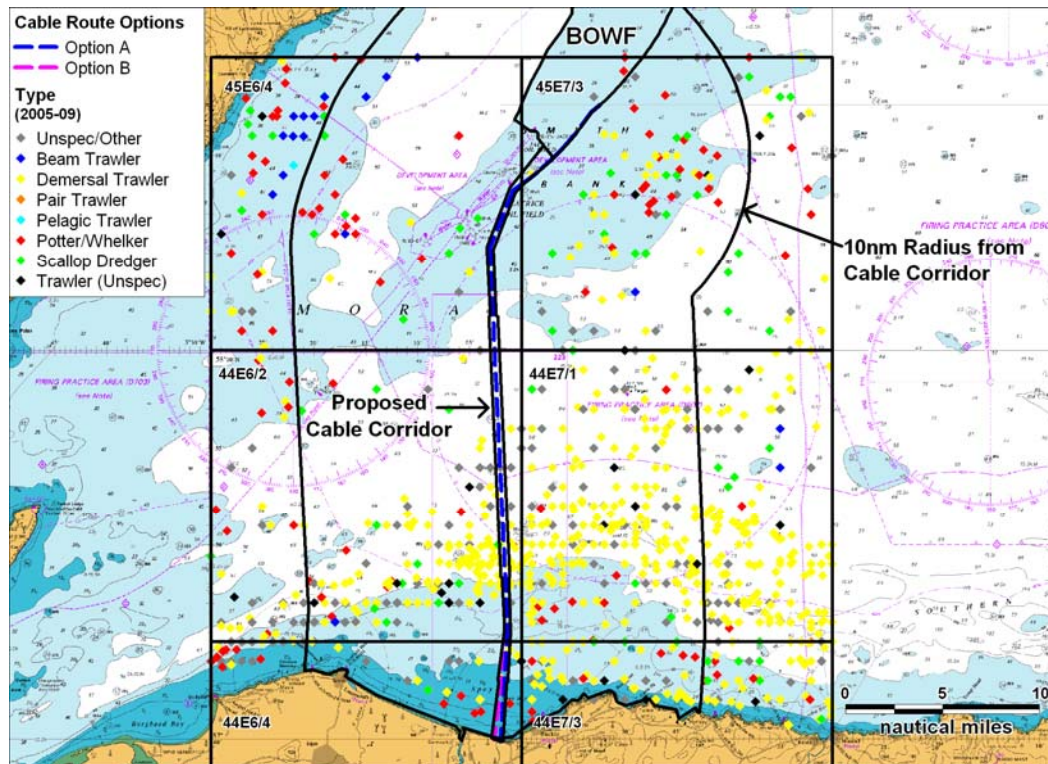


Figure 7.2 Fishing vessels Gear Type

The main fishing method overall was demersal trawling, accounting for approximately 54% of all sightings with potters accounting for 10% and scallop dredgers accounting for 8% of sightings. It is noted that 20% of sightings were unspecified.

In terms of the cable corridor the majority of sightings intersecting, and in close proximity to the proposed route were demersal trawlers operating 7-11nm north of the land fall options. Scallop dredgers were also recorded in the vicinity of the cable corridor and within Spey Bay there were a number of potter/static gear fishing vessels recorded.

7.5.4 Sightings Activity Analysis

The fishing vessels colour-coded by activity when sighted are presented in Figure 7.3.

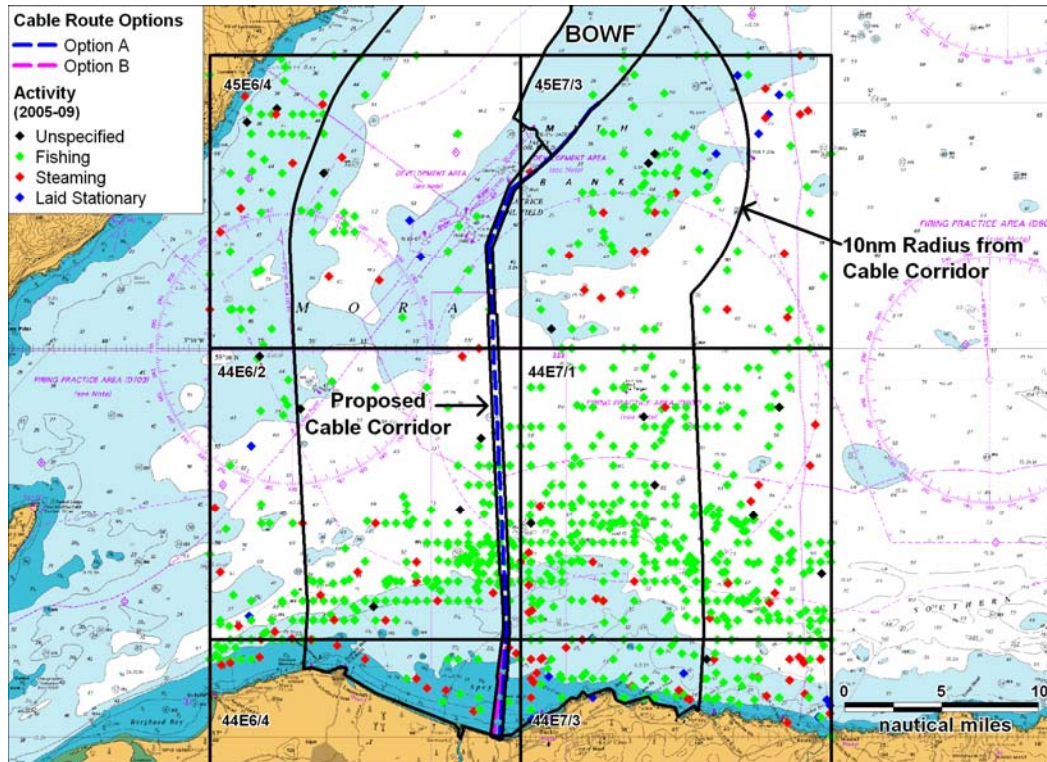


Figure 7.3 Fishing vessels by Activity

Excluding unspecified (2%), 85% of vessels sighted were engaged in fishing, i.e., gear deployed, 11% were steaming (transiting to/from fishing grounds) and 2% were laid stationary (vessels at anchor or pair vessels whose partner vessel is taking the catch whilst the other stands by).

Within the proposed cable corridor, 85% of vessels sighted were engaged in fishing (12) and 15% were steaming (2).

7.6 Satellite Data Analysis

The sightings data indicates that the majority of fishing vessels in the area are registered in the UK. Furthermore, from the 2009 satellite data less than 0.5% of the positions recorded were foreign vessels, (22 French, 10 Faroes and 9 Irish).

The fishing vessel satellite positions recorded in 2009, colour-coded by vessel type (where available), is presented in Figure 7.4.

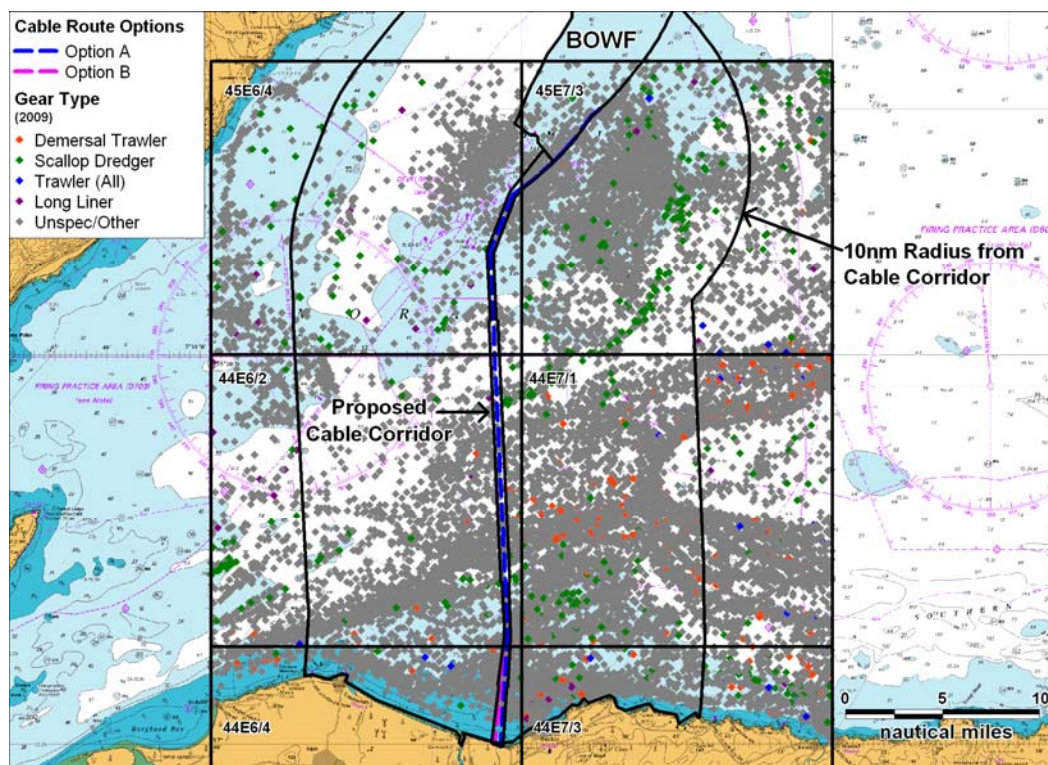


Figure 7.4 Chart of Fishing Vessel Positions by Type (2009)

Excluding unspecified (94%), the majority of vessels recorded by satellite tracking were scallop dredgers (3.3%), long liners (1.4%), demersal trawlers (1.1%), and trawlers (pair/beam) (0.2%).

From the satellite positions plot it can be seen that there are relatively higher density areas of fishing vessels recorded within the cable corridor, i.e. within Spey Bay (2-6nm from the land fall options), further offshore (8-12nm) and 2nm south west of the Beatrice Offshore Wind Farm.

Vessel gear types identified within the cable corridor were mostly unspecified (97%). The remaining vessels were scallop dredgers (1.9%), unspecified trawlers (0.8%) and demersal trawlers (0.4%).

Figure 7.5 presents a chart of fishing vessel positions recorded with an average speed equal to or less than 5 knots (likely to be fishing).

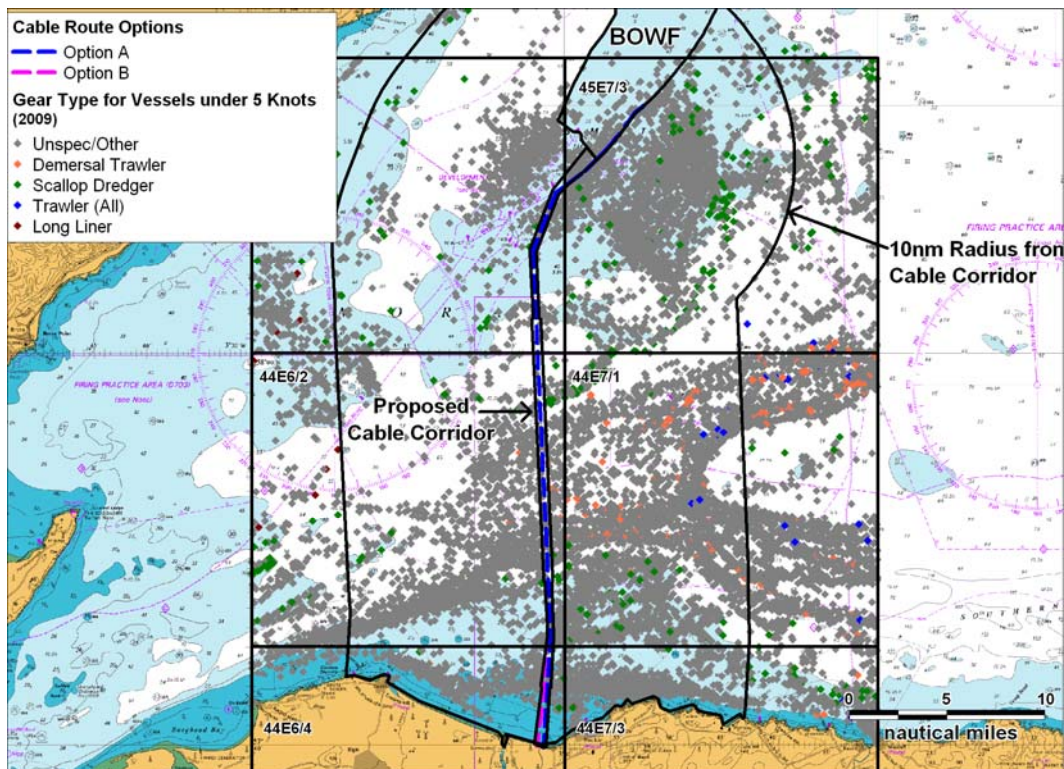


Figure 7.5 Chart of Fishing Positions under or equal to 5 knots by Type (2009)

It can be observed that there are two areas of potential fishing activity (within 5nm south west of the wind farm and over 3nm north of the land fall options) which are intersected by the proposed export cable corridor.

This fishing vessel position data is used in the high level cable hazard review (Section 8).

8. RISKS TO CABLE

8.1 Introduction

This section describes the main hazards which could pose a risk to the Beatrice Offshore Transmission Works. The following hazards are described in detail:

- Fishing gear interaction
- Vessel foundering
- Dropped object
- Anchoring

Following identification of the hazards, a risk assessment is carried out using a grid populated with risk rankings.

8.2 Fishing Gear Interaction

Fishing activity in the vicinity of the Beatrice Offshore Wind Farm and export cable works has been performed as part of the Environmental Impact Assessment (EIA) (Ref. v).

The main fishing types considered to be a risk to the cable are bottom trawling (on the seabed) and scallop dredging. This differs from mid water trawling (pelagic) where the net is towed higher in the water column and poses no risk of interaction with a subsea cable.

8.2.1 Demersal Trawl (Otter Trawl)

This is the most commonly used towed gear in UK fisheries. Both finfish and shellfish found on or near the bottom are taken by this method.

The gear consists of a net in the shape of a funnel attached to the vessel by wire ropes or 'warps'. As the net is towed over the sea floor the mouth is kept open by a combination of boards, floats and weights. The tail end of the net where the fish are trapped is the 'cod end'. Figure 8.1 presents a schematic of a typical Bottom (Otter) trawler.

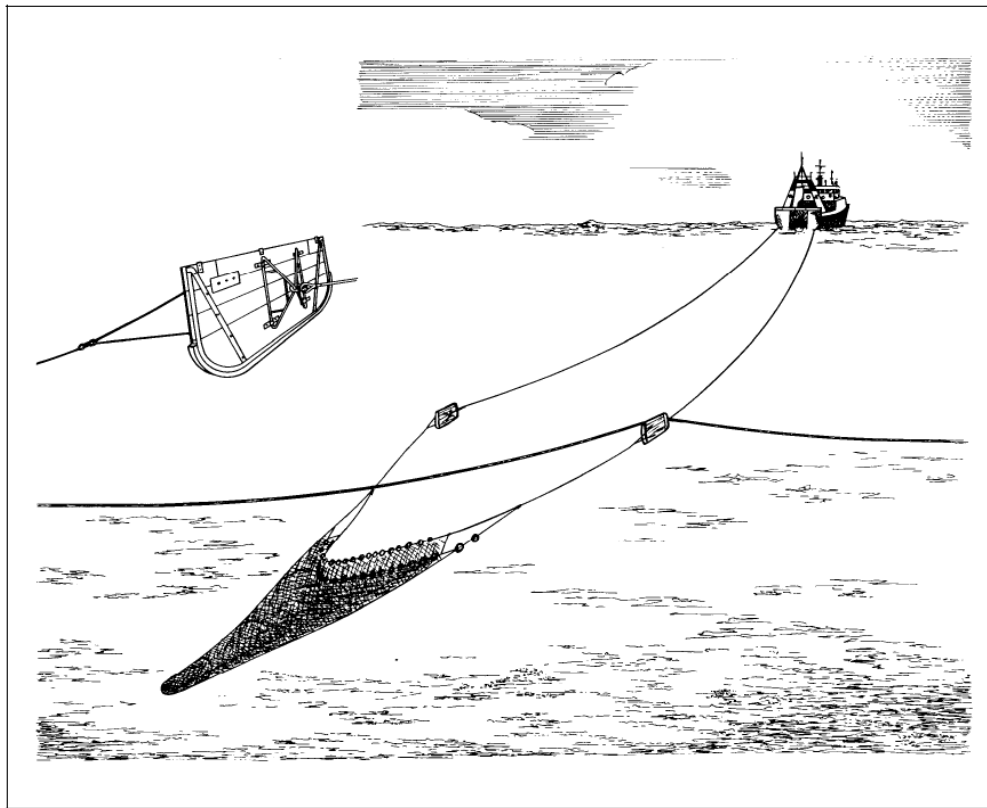


Figure 8.1 Example of Bottom (Otter) Trawl Catching a Cable (Ref. vi)

The length of the trawling wires (warp) is normally about three and a half to four times the depth of the water and can be used in distances of 100-450m from the stern of the vessel. Figure 8.2 presents a schematic of a Twin Demersal Otter trawler.

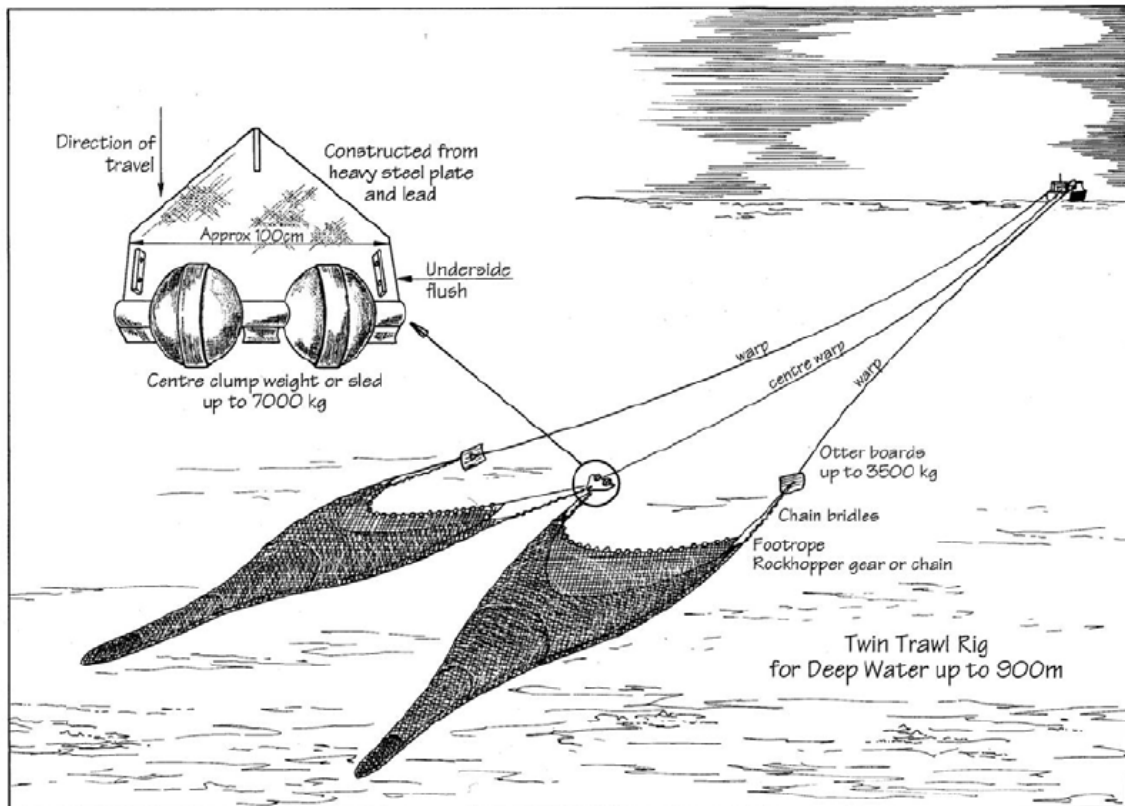


Figure 8.2 Twin Demersal Otter Trawl (Ref. vi)

The main components of an Otter Trawl that have the potential to hook a subsea cable are the trawl doors and the clump weight.

8.2.2 Beam Trawl

The Beam Trawl is a bottom fishing trawl net, used mainly for catching demersal flatfish with the head rope attached to a beam towed along the bottom on runners at either end. The net is heavily weighted with a chain on the underside and has tickler chains running in front.

A schematic of a typical Beam trawler is present in Figure 8.3, below.

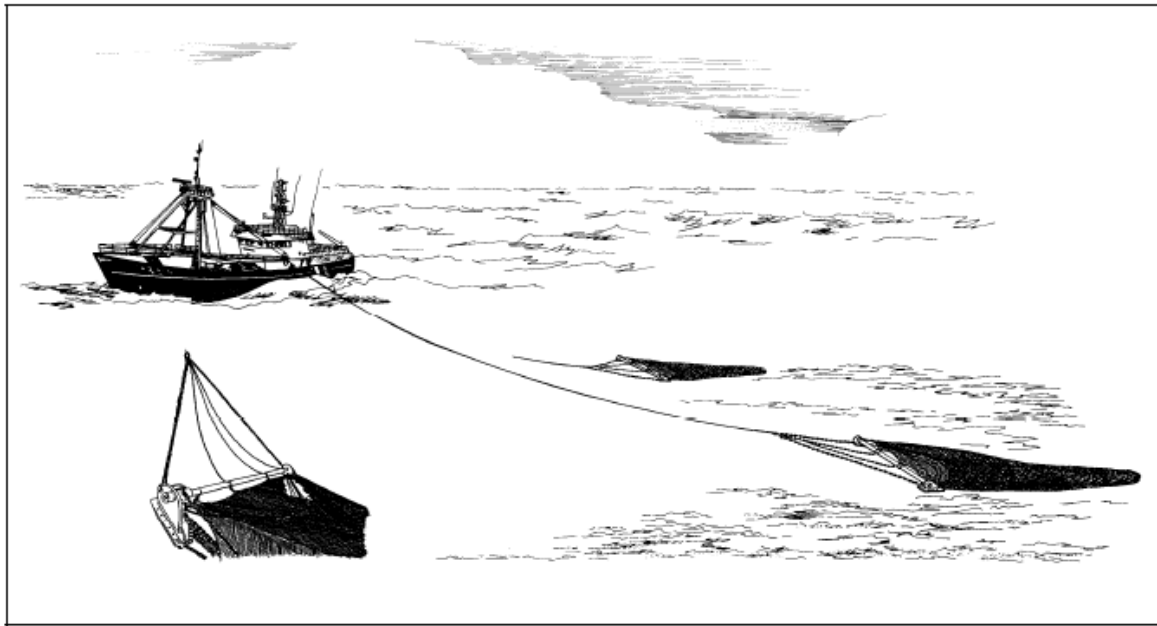


Figure 8.3 Beam Trawler (Ref. vi)

The main components of a Beam Trawl that have the potential to hook a pipeline are the beam and runners/shoes.

8.2.3 Scallop Dredger

Most Scallop Dredgers have a chain bag which drags along the bottom collecting the catch. Some also use steel teeth which penetrate the seabed for a few centimeters. Like other gear types, greater bottom penetration can occur under unusual conditions, such as when a dredge pushes a rock ahead of it.

A dredge 4.5m wide with tickler chains can weigh in excess of 2,200kg when empty. With towing speeds ranging up to five knots, this type of gear can easily damage a submarine cable. In some fisheries, deflecting bars and wheels have been added to help the gear pass over seabed obstacles. Such devices may also help prevent entanglement with cables.

An example of a typical Scallop Dredger is presented in Figure 8.4.

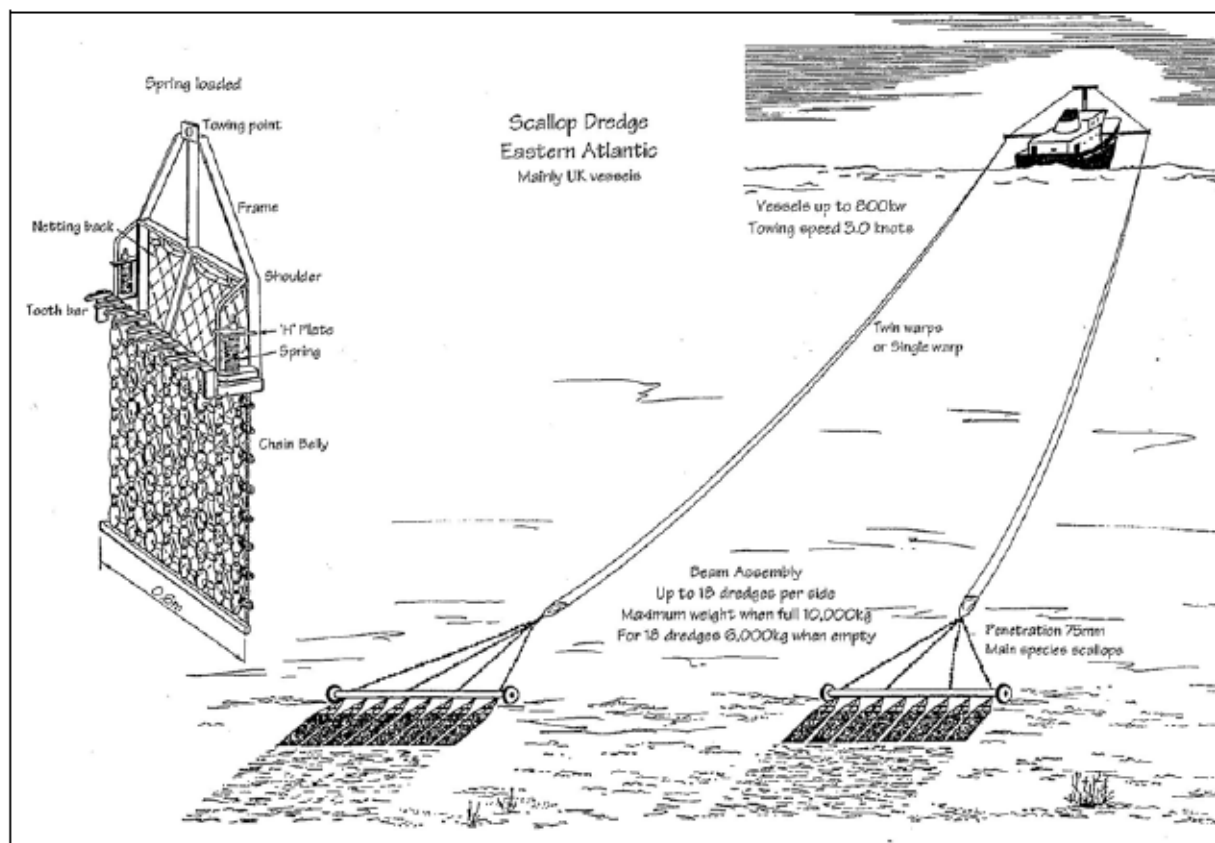


Figure 8.4 Plan View of Scallop Dredger (Ref. vi)

8.2.4 Gear Interaction with Cables

When trawl gear is towed over or along a cable the interaction can be considered in three phases as described below.

- **Impact:**
 - The initial phase when the trawl board, beam shoe or clump weight hits the cable. This impact occurs over a short time frame and mainly results in localised damage to the shell and protective coating of the cable. This stage has the potential to damage the cables but rarely damages the trawl gear and there is negligible risk to the fishermen on board the vessel.
- **Pull over:**
 - When a trawl board, beam trawl or clump weight is pulled over the cable. The duration of this phase is longer than that of the initial impact and forces can be significantly greater. Again the risks to fishermen during this phase of the interaction are limited.
- **Hooking:**
 - Hooking occurs when the trawl equipment becomes “stuck” under the cable. This tends to be a low probability event but it represents the greatest risk to fishermen.

Fishing vessel density per grid cell in the area of the cable corridor was categorised based on the satellite tracking data (VMS) which provided more comprehensive coverage of the proposed export cable corridor compared to over-flight data and survey data collected.

As noted (see Section 7.4) VMS data does not cover smaller fishing vessels, (i.e. small potters off the Moray coast), however in terms of damage to the cable; satellite tracking data covers bigger vessels with heavier/larger gear, which are higher risk.

Satellite tracking positions with speeds equal to or less than 5 knots were selected (it is assumed a vessel travelling over 5 knots will not be fishing, see Figure 7.5).

Grid cells were ranked from 0 (no activity) to 5 (highest activity).

8.3 Vessel Foundering

A foundering is considered to be when a vessel suffers structural failure and sinks. This type of an incident has the potential to damage a subsea cable if the vessel sinks over the cable. It is noted that this type of an incident is considered to be a very low frequency event based on historical incident data for the UK (from 1994-2008 approximately 4% of all MAIB incidents were flooding/founders).

Cells with a high density of shipping or in heavier seas/open sea water were given a rank of 1. It is noted that duplicate incidents (recorded in both databases) were not considered.

In addition the last ten years of RNLI and MAIB incident data (2001-2010) was analysed to extract incidents where a vessel foundered or was lost (i.e. fire or explosion). For these specific areas a 500m radius was created around each incident (to take into account vessel break-up or drifting once submerged). Cells that were intersected by a foundering incident area were given the highest risk ranking (5).

8.4 Dropped Object

A dropped object could arise during transfer operations in port, at an offshore oil and gas installation (over-side lifting) or during lifting works from an offshore barge or construction jack-up.

Dropped objects from commercial vessels (e.g. container ships or Roll on-Roll off vessels (RO-ROs)) are more likely to take place during adverse weather and heavier sea conditions (open sea environments). Many factors are likely to influence the potential damage caused to a subsea cable from a dropped object (e.g. type, size and velocity).

Combined AIS data collected from the *Chartwell* and *Gargano* surveys (56 days) was used to extract information on vessel types passing through the wider study area.

A rank of 1 to 5 was populated into each cell within the grid (highest risk of dropped object from a container ship or Ro-Ro vessel in open sea). Offshore support vessels and general cargo vessels were considered medium risk and given a risk ranking of 2. Offshore support vessels tend to stand-off platforms between transfer operations, and Beatrice B and CSS is located 0.35nm west of the cable corridor.

During the maritime surveys offshore support vessels were recorded within the cable corridor whilst waiting on cargo transfer and close stand-by duties. A risk of 2 was given to cells within the Beatrice Development Area and Jacky Oil Field to promote dialogue. It is likely that this can be reduced to 1 following consultation and will represent a negligible risk.

Military training areas could also pose a risk to a subsea cable due to firing of munitions from coastal ranges and marine based firing/bombing areas used by the Royal Navy and RAF. It is difficult to quantify the number of munitions which explode on the sea bed; however spent shells/explosives may land on the sea floor in PEXA D807. Following consultation/scoping replies from the Defence Infrastructure Organisation the ranking of cells which encompassed a military firing area were given a rank of 1.

8.5 Anchoring

Anchoring has the potential to damage a subsea cable if a vessel drops anchor or drags anchor over the cable. The damage caused depends on the penetration depth of the anchor (which depends on vessel size and type of anchor), the type of seabed and depth to which the cable is buried. It is considered that anchor interaction with a subsea cable will be similar to that of fishing gear interaction, based on impact, pull over and potential snagging phases.

Anchoring can take place for a number of reasons. The following scenarios are likely to lead to a vessel anchoring:

- Adverse weather anchoring (e.g. in a safe haven);
- Anchor dragging (e.g. adverse weather impacting a vessel at anchor or when a vessel drops anchor for emergency reasons – collision or drifting)
- Machinery failure (e.g. to slow drift speed/stop and/or to carry out repairs);
- Waiting on orders (e.g. commercial vessels and/or drilling rigs);
- Waiting on approach to a port (e.g. port berth or pilotage); and
- Subsea operations/survey vessel and semi-submersible drilling rig anchoring.

Vessels that were involved in machinery failure incidents (e.g. fouled propeller, sail failure, out of fuel or engine breakdown) can drop anchor to reduce drift speed (not under command). In addition, incidents that recorded an anchor dragging were also extracted from the RNLI and MAIB incidents and ranked the highest risk level to the cable route (5).

Furthermore, anchoring identified from the AIS surveys (56 days) was also extracted. Cells intersected by one anchored vessel were given a rank of 3 and cells intersected by two or more vessels and/or multiple days of anchoring were given a rank of 5. It is noted that when the cable is installed and charted, the probability of planned anchoring in close proximity to the cable route reduces.

8.6 Risk Assessment

A 1km x 1km grid consisting of 2,750 cells was created for the wider cable corridor area (10nm from the proposed cable routes) and populated by risk rank (0-5) for the selected hazards. The scores per cell were summed (maximum 20) and distributed into five sensitivity ranges, with approximately 20% in each rank.

An overview chart showing the proposed export cable corridor colour-coded cable risk ranking is presented in Figure 8.5.

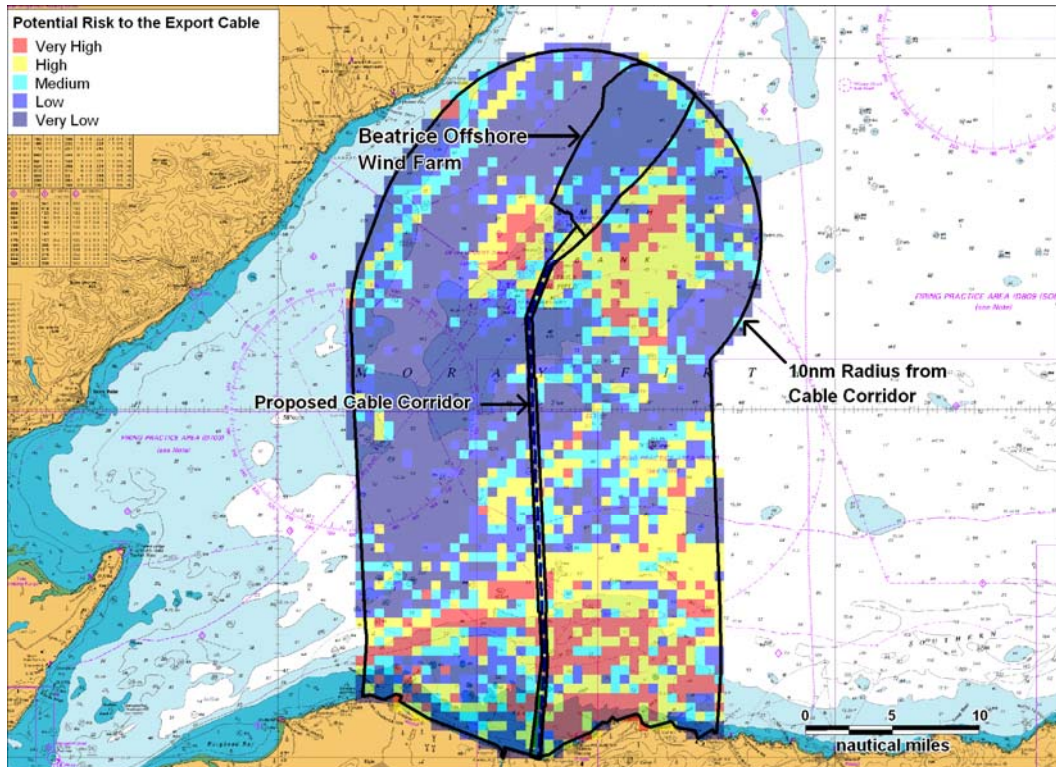


Figure 8.5 Overview of Cable Risk Ranking for Wider Study Area

A number of High and Very High risk areas were located off Buckle, Lossiemouth and in Spey Bay. The risk relates to a high number of machinery failures, passing shipping, anchoring and fishing within approximately 10nm of the coast.

Medium/High risk areas were identified approximately 4nm south of the Beatrice Offshore Wind Farm and 11-17nm north of Buckie. This risk relates to the military firing areas, fishing activity, dropped object risk at the Beatrice and Jacky Oil Fields, and anchoring which occurs in Spey Bay.

The following subsections present the offshore transmission works risk ranking for the northern and southern sections of the proposed cable route.

8.6.1 Northern Export Cable Corridor

Figure 8.6 presents the sensitivity results for northern section of proposed the export cable corridor.

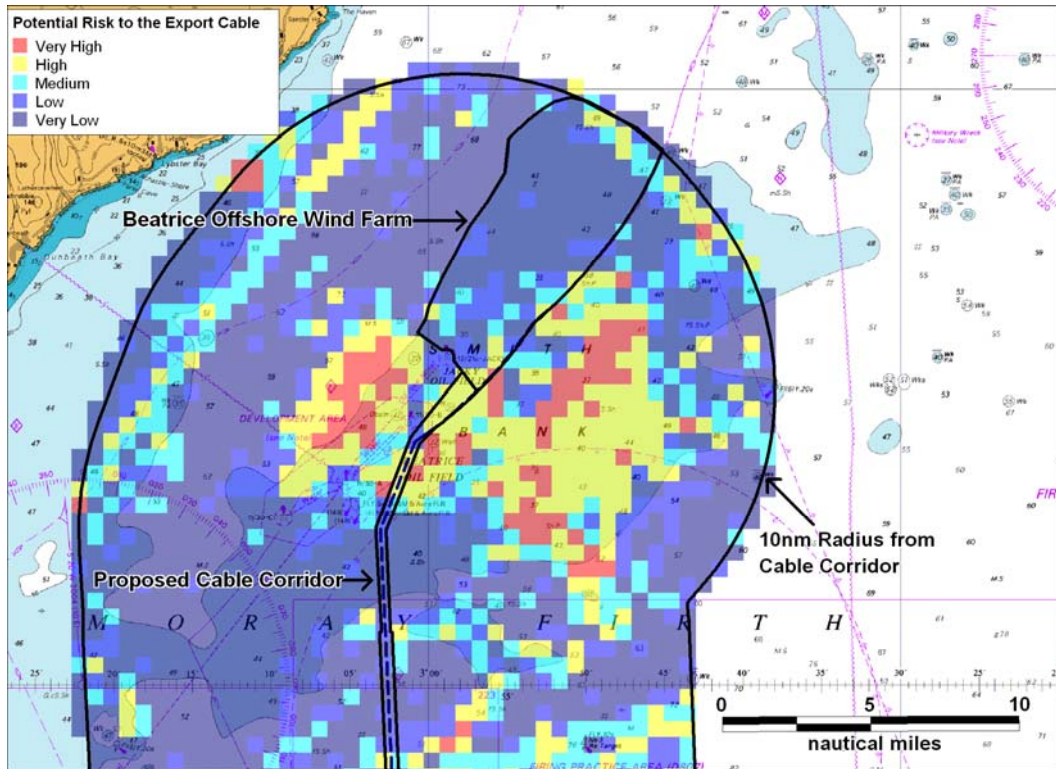


Figure 8.6 Detailed Risk Ranking for Northern Export Cable Corridor

The areas of High-Medium risk relate to high fishing density and dropped object risk east and west of the cable route.

8.6.2 Southern Export Cable Section (Land Fall)

Figure 8.7 presents an overview of the cable sensitivity risk results for the southern section of the proposed export cable route corridor.

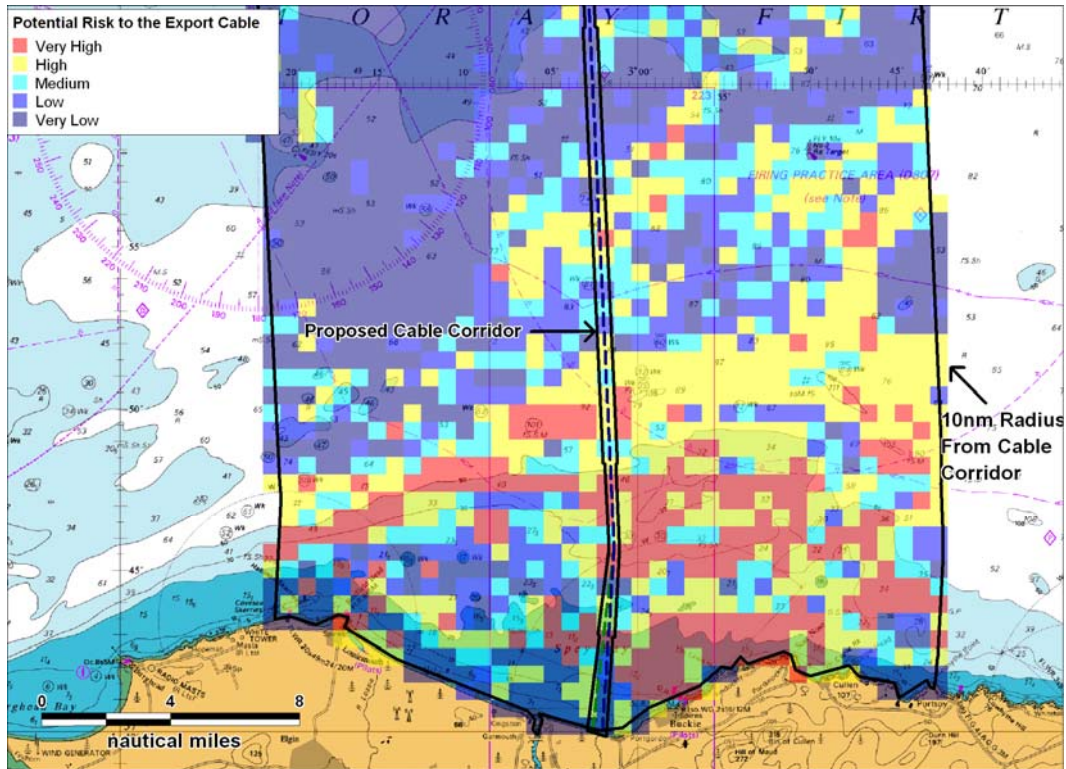


Figure 8.7 Detailed Risk Ranking for Southern Export Cable Corridor (Landfall)

The areas of Medium and High risk relate to the higher rate of historical machinery failures, fishing activity and anchoring within Spey Bay.

Fishing activity is focused north of Buckie and approximately 7nm north of Spey Bay (mainly demersal trawling), with coastal shipping passing east/west.

9. SHIPPING AND NAVIGATION IMPACT REVIEW

9.1 Introduction

Following identifying the baseline shipping and high level hazard review, an assessment of the impacts of the Beatrice Offshore Transmission Works are assessed for the installation, operation and decommissioning phases of the project.

It is noted that the potential impacts associated with decommissioning of the Beatrice Offshore Transmission Works will be entirely dependent upon the method used for decommissioning and if it is decided that the cable shall remain buried in the seabed.

It is anticipated that the impact resulting from the decommissioning of the export cable(s) shall be minimal in terms of disruption to shipping and navigation. In addition, any effects should be assessed as part of the EIA undertaken to inform the final decommissioning plan.

9.2 Commercial Shipping

Impacts on commercial shipping from the export cable route are assessed in the following subsections.

9.2.1 Impact on Commercial Ship Routeing

The main shipping lane intersecting the cable corridor is the coastal route used by vessels headed east/west to Inverness and Cromarty Firth. This route is largely composed of small to medium coastal cargo ships and a number of shuttle tankers routeing in deeper water (up to 8nm from shore).

Due to the draughts of these ships and water depth vessels tend to keep at least 1.3-2.5nm north of the Moray and Aberdeenshire coast, well clear of shallower areas where there may be the possibility of a grounding impact.

Offshore supply vessels also intersect the shared cable corridor, east of Beatrice Oil Field, when travelling between the Beatrice Oil Field and offshore supply bases (Peterhead and Aberdeen). In addition, Wind Cat crew transfer vessels were also recorded intersecting the cable routes when travelling between Buckie and the Beatrice/Jacky platforms

Given the available sea room in the Moray Firth, east and west of the of the cable route corridor and the low levels of inshore commercial vessels in close proximity to the export cable landfall location, there will be minor impact on commercial ship routeing. The main impacts will be of a temporary nature during the cable laying/installation process.

9.2.2 Impact on Anchoring

A Navigational Hazard Review Workshop, carried out in July 2011, as part of the NRA for the offshore wind farm developments within the Moray Firth. The workshop highlighted that the Moray Firth provides vessels with sheltered anchorages, inshore of adverse sea and weather conditions that can be experienced in the North Sea. Vessels including, shuttle

tankers, offshore supply ships, military vessels, survey and cable laying vessels anchor off the Moray Firth coastline during severe weather.

Larger vessels mainly anchor further from shore; with a crude oil tanker recorded approximately 8nm from the cable land fall options, in good holding ground (sand and muddy sand) which is considered to be highly mobile (in terms of sea bed mobility).

Small to medium sized cargo vessels and other ships (e.g. tugs, offshore vessels and mobile drilling rigs) were recorded using more inshore anchorages in Spey Bay or Cullen Bay, in closer proximity (under 10nm) to the proposed cable corridor. The sea bed type in Spey Bay is less mobile, and is mainly coarse sediment and gravels.

It is expected that following installation of the cable and marking on admiralty charts, the vessel anchoring activity is likely to migrate east (towards Lossiemouth) and/or west (off Buckie) of the cable. It is noted that there are a number of alternative anchorages described in the pilot book for the area and marked on admiralty charts (Burghead Bay, Cullen Bay and Whitehills).

The risk of anchor interaction for both land fall options is considered to be higher in the Spey Bay area, therefore, to minimise the impact on current anchoring practices, cable protection and burial should be explored to decrease the likelihood of anchor dragging or snagging cables.

Overall the risk of dragging anchor onto the cable is considered to be minor on the basis that risks still exist, although low.

9.2.3 Impact of Increased Traffic (cable laying and marine operations vessels) on Commercial Ship Routes

The presence of cable laying vessels within the proposed export cable corridor can pose additional risk to navigation. This is mainly due to increased vessel activity and the fact that cable laying vessels are restricted in manoeuvrability. Vessels on the routes intersecting the cable corridor could be impacted in terms of routeing distance, time and fuel cost, as they will deviate from their current route to avoid cable laying works. Given the temporary nature of the cable laying the impact ship routeing time, distance and fuel, is predicted to be minor.

It is considered that there is available sea room in the area for passing vessels to route around additional marine operations traffic and cable laying vessels, therefore the risk of collision is low. Assuming industry standard safety management systems and mitigation, it is expected that cable laying works can be carried out safely, with a minor impact to shipping and navigation.

9.3 Impact on Recreation Vessels

The proposed cable corridor is intersected by a number of RYA recreation cruising routes and a general sailing area is located within Spey Bay. In addition, during the survey, a small number of recreational vessels were recorded sailing off the Moray coastline to Lossiemouth.

Scoping comments from RYA indicated that it is unlikely that there would be any significant impact of the proposed works on recreational sailing either in the construction or operational phases.

Overall, a negligible impact is predicted on recreational vessel routeing (additional time and fuel cost) and collision risk, given available the sea room in the area and assuming works are safely managed using Safety Management Systems (SMS).

In a similar manner to those discussed for commercial and fishing vessel activities, the impact on navigation associated with cable laying is considered to be minor.

9.4 Impact on Fishing Vessels

Impacts on fishing vessels from the export cable route are assessed in the following subsections.

9.4.1 Impact on Fishing Vessel Routeing

The surveys recorded fishing tracks approximately 10nm north of the proposed cable land fall options. Vessels were also recorded steaming to the nearby fishing ports of Portgordon, Buckie, Banff and Macduff.

Local fishing vessels will be aware of construction works and cable laying vessels within the Beatrice Offshore Transmission Works boundary through NtMs and fisheries liaison. Non-local fishing vessels will become aware of the cable laying activities as they arrive at fishing grounds through day marks and lights used by the cable laying vessels to warn passing vessels of restrictions in manoeuvrability.

Assuming industry standard safety management systems and mitigation, it is expected that cable laying works can be carried out safely, with a minor impact to fishing vessel activities.

9.4.2 Impact on Fishing Gear Interaction

The impact of the cable works on fishing grounds and potential gear interaction is covered in detail within the Commercial Fisheries Assessment (Ref. v).

The predominant fishing activity intersecting the proposed cable corridor were fishing for nephrops, demersal trawling, scallop dredging and creelers (potters) operating within Spey Bay and trawlers operating south of the Beatrice Offshore Wind Farm.

There is risk to fishing vessels should they snag their gear on cable trench spoil, unprotected or cables running over spans. However with cable protection/burial and liaison with the fishing industry, it is considered, that operation of the Beatrice Offshore Transmission Works will be of minor significance to fishing vessels.

9.4.3 Impact of Increased Traffic (cable laying and marine operations vessels) on Fishing Vessel Navigation

The presence of cable laying vessels within the proposed export cable corridor can pose additional risk to navigation of fishing vessels. This is mainly due to increased vessel activity and the fact that cable laying vessels are restricted in manoeuvrability.

It is considered that there is available sea room in the area for vessels to route around additional marine operations traffic and cable laying vessels.

Local fishing vessels will be aware of construction works and cable laying vessels within the cable corridor through NtMs and fisheries liaison. Non-local fishing vessels will become aware of the cable laying activities as they arrive at fishing grounds through day marks and lights used by the cable laying vessels to warn passing vessels of restrictions in manoeuvrability.

Assuming industry standard safety management systems and mitigation, it is expected that cable laying works can be carried out safely, with a minor impact to fishing vessels.

9.5 Impact on Small Vessel Anchoring

The impact on smaller vessel anchoring and risk of dragging anchor, including fishing and recreational vessels is expected to be similar in nature and extent to those discussed for commercial shipping anchoring impacts. However, small vessels are likely to seek more sheltered/inshore anchorages, which are not limited by sea depth and anchor chain length.

As identified for commercial shipping, alternative anchorages are described in the pilot book for the area and marked on admiralty charts (Burghead Bay, Cullen Bay and Whitehills). Therefore, assuming industry standard mitigation/cable burial and surveys to monitor export cables, the impact on small vessel anchoring and dragged anchor risk will not be significant.

Consultation carried out with RYA and CA during the NRA (for wind farm and export cable works) stated that consultees would like the export cables buried, particularly near port approaches. However, RYA/CA noted this is not considered an issue where sea depth is less than 10m (approximately 0.62m north of the two cable land fall options).

9.6 Electromagnetic Interference on Navigation Equipment

An additional navigational impact was identified based on electromagnetic interference on small vessels (mainly recreational craft and small fishing boats) navigation equipment including compasses and communication equipment.

High Voltage Direct Current (HVDC) export cables can be used given the ability to transmit large amounts of power over long distances with lower costs and reduced power losses compared to Alternating Current (AC). However, HVDC export cables can cause deflection of a compass needle through electromagnetic interference. In addition, some vessels use an auto-pilot which is reliant on a magnetic sensor and may experience slight steering issues if crossing a HVDC cable.

Based on the findings of the trials at the North Hoyle Offshore Wind Farm (Ref. vii), the wind farm generators and their cabling, inter-turbine and onshore, did not cause any compass deviation during the trials. However, it is stated that as with any ferrous metal structure, caution should be exercised when using magnetic compasses close to turbine towers.

In addition, studies have found that the greater distance the compass is from the cause of interference, the less impact will be experienced.

It is assumed that if a HVDC is installed from the Beatrice Offshore Wind Farm there could be a small magnetic field generated from the cable. It is noted that the magnetic field can mostly be cancelled out by two opposing pole. In addition, all equipment and export cables from the development will be rated and in compliance with design codes.

The export cables will be buried (proposed to be at least 55% of the length) and protected as per the trenchability study. Therefore any generated electromagnetic fields will be very weak and will have a minor impact on navigation or electronic equipment.

9.7 Impact on Search and Rescue

A review of historical incidents indicated that the incident levels in the vicinity of the cable corridor have tended to be low, see Section 4. The risk assessment also indicated that there will not be a significant increase in the frequency of maritime incidents due to the export cable.

In the event of an emergency arising, within or adjacent to the cable corridor, the main types of SAR would be carried out by RNLI ALB and/or SAR helicopter. A review of the assets in the area of the application site boundary indicated that the closest ALB is at Buckie (2.5 nm east), whilst there is a SAR helicopter base located at Lossiemouth, approximately 11 nm west of the OfTW cable corridor. This RAF base has Sea King helicopters with a maximum endurance of six hours giving a radius of action of approximately 250 nm which is well within the range of the OfTW.

It is considered that SAR operations will not significantly impacted by the cable works in terms of transit time, given the temporary nature of cable laying, the proximity to SAR resources (Lossiemouth and Buckie) and the available sea room in the area for lifeboats to deviate around works.

Giving account to the design features associated with the Beatrice Offshore Wind Farm and export cable, and commitments by the developer to meet the MCA Marine Guidance Note (MGN) 371 guidance and industry best-practice, including the development of an Emergency Response Co-operation Plan (ERCoP) pre-construction and in collaboration with the nearby offshore operators, it is considered that SAR issues can be well managed.

10. CUMULATIVE AND IN-COMBINATION EFFECTS

10.1 Introduction

Cumulative impacts with maritime activities (shipping, fishing, recreation and associated facilities) are assessed in the main part of this report. The following sections present details on possible cumulative effects with the Moray Firth Round 3 Zone and other offshore projects.

In-combination effects with other future developments in the area are assessed, including offshore developments relative to the Beatrice Offshore Wind Farm export cable.

10.2 Developments Considered in the Cumulative and In-Combination Assessment

The following list presents the developments which were considered for the cumulative and in-combination assessment based on the Moray Firth Offshore Wind Developers Group (MFOWDG), Cumulative Impact Assessment Discussion Document (CIADD):

- Moray Firth Round 3 Zone (western and eastern development areas);
- Other Offshore Wind Farms and Infrastructure:
 - Aberdeen European Offshore Wind Deployment Centre (EOWDC);
 - Neart na Gaoithe;
 - Inch Cape;
 - Firth of Forth Round 3 sites;
 - Methil Offshore Windfarm; and
- Subsea Cables:
 - MORL Offshore Export Cable and onshore infrastructure;
 - BOWL Offshore Export Cable and onshore infrastructure;
 - Proposed Viking SHETL cable and onshore infrastructure; and
- Proposed SHETL hub;
- Pentland Firth and Orkney Marine Energy developments;
- Shipping and Navigation;
- Military and Aviation activities;
- Dredging and sea disposal in the Moray Firth;
- Oil and Gas Developments:
 - Beatrice and Jacky platforms and associated infrastructure; and
 - The proposed Polly Well.

10.3 Predicted Impacts

A high level review of the offshore developments was undertaken to screen out those that would not result in a cumulative impact. Details of the developments that were screened out are provided below:

- The offshore wind farms in the Outer and Firth of Forth (Near na Gaoithe, Inch Cape, Firth of Forth Round 3 sites and Methil) and the turbines planned at the Aberdeen EOWDC are of a scale and at a sufficient distance that there will not be a cumulative impact on shipping and navigation;
- The Pentland Firth and Orkney Marine Energy developments have been screened out, given that the majority of construction and operation/maintenance vessels will be routeing from local support bases (e.g. Scrabster, Stromness, Kirkwall and Lybster) and as a result vessels will not navigate in the vicinity of the export cable works;
- A small number of military vessel tracks were recorded during the maritime surveys within 10 nm of the export cable works. Given the low level of activity and positive scoping comments received from the Defence Infrastructure Organisation on the export cable works, the cumulative impacts on marine based military activities are not considered to be significant; and
- Currently there are no licensed aggregate dredging areas in the Moray Firth. There are a small number of chartered dredge sea disposal (spoil grounds) located within close proximity to the coast (approximately 4 nm). There is available sea room in the Moray Firth for transiting dredge and/or sea disposal vessels. In addition, given the size of ships working from local ports and small harbours, vessels are likely to use more sheltered coastal routes. Therefore the cumulative impact of the export cable works is not significant.
- Given the relatively low commercial shipping density in the Moray Firth and the availability of sea room off the cable corridor (i.e. for LNG tankers headed into the Moray Firth) it is considered that any future in-combination impact of Beatrice Offshore Wind Farm export cable works will be negligible.

The potential shipping and navigation impacts for the remainder of offshore developments were considered further giving account to:

- Changes to commercial, fishing and recreational vessel routeing; and
- Increase in collision risk (vessel-to-structure or vessel-to-vessel).

Table 10.1 presents the cumulative and in-combination effects identified during the NRA.

Table 10.1 Cumulative and In-Combination Developments Considered

Cumulative and In-combination development considerations		Scoped Out
Cumulative Impact	Moray Firth Round 3 Zone and associated wind farms/export cables	No
	Aberdeen European Offshore Wind Deployment Centre	Yes
	Near na Gaoithe Offshore Wind Farm	Yes

Cumulative and In-combination development considerations		Scoped Out
	Inch Cape Offshore Wind Farm	Yes
	Firth of Forth Round 3 sites	Yes
	Methil Offshore Wind Farm	Yes
In-combination Impact	Oil and Gas developments at Beatrice / Jacky Fields and the proposed Polly Well	No
	Proposed Scottish Hydro Electric Transmission Limited (SHETL) hub and cable.	No
	Pentland Firth and Orkney Marine Energy developments;	Yes
	Liquid Nitrogen Gas (LNG) regasification vessels proposed to do transfer operations at the Nigg Terminal	Yes
	Dredging and sea disposal/spoil grounds in the Moray Firth	Yes
	Military and aviation activities	Yes

10.4 Wind Farm Developments

The nearest potential wind farm development area is located in the Moray Firth Round 3 Zone, on the eastern boundary of the Beatrice Offshore Wind Farm site. The proposed cable corridor passes through the centre of the Western Development Area of the Moray Firth Round 3 Zone for approximately 6.2nm.

Given the proximity of the Moray Round 3 Zone to the Beatrice Offshore Wind Farm development, MFOWDG was formed by BOWL and MORL in partnership with The Crown Estate to work collaboratively on potential regional cumulative impacts arising from their proposed offshore wind development.

As part of this collaborative approach, a joint navigational Hazard Review workshop and a number of consultation meetings were carried out (MCA, CoS, RYA/CA, NLB and Oil & Gas operators). This approach allowed marine stakeholders to be consulted on both developments.

In terms of the Wind Farm export cable corridor, cumulatively there will be an impact if the cable installation and construction phases of wind farm developments in the Western Development Area overlap. There could be reduced sea room across the Western

Development Area due to the presence of wind farm construction and cable laying ships, and vessels of this type will be restricted in manoeuvrability.

The first export from the Wind Farm is expected to be in the second quarter of 2015 and any construction works within Western Development Area are likely to occur in the second quarter of 2019, therefore the cumulative impact is not considered to be significant.

In terms of the export cable works from the Moray Firth Round 3 Zone wind farms it is considered that there will not be a significant cumulative impact on shipping and navigation due to the separation distance between the expected cable corridors and the Beatrice Offshore Wind Farm export cable works.

10.5 Oil and Gas Developments

Consultation with Oil and Gas Operators identified the potential decommissioning of Jacky to be a possible issue, however this is largely dependent on other offshore developments in the area, as there are possible tie-ins planned with the Polly development (2nm south east of the Beatrice Field).

A possible in-combination impact will be on access to the platforms in the Jacky and Beatrice Fields and the proposed Polly development (i.e. future drilling and decommissioning of installations).

There could be an in-combination impact during installation of the export cable, as cable laying vessels tend to be restricted in manoeuvrability and there could be reduced sea room in the cable corridor (east of the Beatrice Field).

In general vessels and rigs tend to route to Beatrice and Jacky Oil Fields from the south and east, and there will be available sea room to deviate around cable laying vessels. Overall, the in-combination impact is considered to be minor.

10.6 Other Developments

SHETL has made proposals for an offshore High Voltage Direct Current (HVDC) cable and hub, which is planned to be located approximately 4.5nm to the east of the Beatrice Offshore Wind Farm.

As commercial shipping density is relatively low within the Beatrice Offshore Wind Farm and export cable corridor, it is considered that any in-combination impact that could occur during overlapping installation phases of the SHETL cable / hub and Beatrice Offshore Wind Farm cable works will be minor.

11. RISK MITIGATION MEASURES & MONITORING

11.1 Introduction

This section summarises the main mitigation measures and monitoring procedures which could be established for the Beatrice Offshore Transmission Works.

11.2 Mitigation

The following risk mitigation measures can be used to protect subsea cables from hostile interaction, (i.e. dropped object, anchor and fishing gear interactions):

- Routing cables on stable and even ground to limit free spans.
- Trenching cables.
- Use of rock dumping to cover cables or to limit the height of free spans.
- Use of concrete mattresses to cover cables so they are more over trawlable.
- Circulating information on cables to the fishing community, e.g. fishing liaison and FISHSafe via Kingfisher Information Services-Cable Awareness (KIS-CA).
- Vessels setting up anchoring alarm zones to warn if an anchor has moved (dragged).
- Circulating information on cables to other marine stakeholders, e.g. local ports, recreation sailing clubs, ship operators and the Defence Infrastructure Organisation.
- Cables routes are charted on United Kingdom Hydrographic Office (UKHO) admiralty charts and potential no anchorage zones shown over cables.
- Monitoring of cable route from Marine Operations/Coordination centre
- Periodic and planned surveys of cable routes to monitor burial depths and sea bed mobility.

Prior to construction, Notices to Mariners (NtMs) and Very High Frequency (VHF) broadcasts should be considered. Safety Management Systems (SMS) will also be in place by vessel operators.

Cables should be buried taking into account sea bed type, fishing and anchoring practices in Moray Firth. Positions of cable routes notified to Kingfisher Information Services-Cable Awareness (KIS-CA) for inclusion in cable awareness charts and plotters for the fishing industry.

Local workshops on shipping and navigation issues have taken place discussing local issues. Consultation should also continue both pre- and post-construction and during the life of the project with the MCA and other relevant stakeholders including offshore operators at the Beatrice and Jacky Oil Fields.

11.3 Future Monitoring

From a navigation risk perspective, monitoring will take place through the project's Safety Management System.

The subsea cable routes will be subject to periodic inspection to ensure they remain buried. Any future maintenance works on the cable route should be carried out following issuing NtMs and broadcasts on VHF.

12. CONCLUSIONS & RECOMMENDATIONS

The hazards associated with the Beatrice Offshore Transmission Works were assessed.

The Moray Firth provides vessels with anchorages that are sheltered from adverse sea/weather conditions. Anchoring within 10nm of the export cable corridors was recorded in Spey Bay (mostly smaller vessels) and north of the cable land fall options (crude oil and shuttle tankers).

The most likely impacts are considered to be from fishing gear interaction and vessel anchoring recorded in Spey Bay. Therefore, an anchor penetration study and Burial Protection Index (BPI) assessment should be carried out to further assess cable protection methods once the cable route has been finalised.

In terms of the impact on shipping and navigation, given the low level of shipping activity along the majority of the cable route, and the available sea room, vessels should be able to increase passing distance from cable laying vessels and associated works.

There is a risk to fishing vessels due to gear snagging on unprotected cables or trench spoil. However with cable protection/burial and liaison with the fishing industry, the impacts on fishing vessels are considered to be minor. The Commercial Fisheries Assessment has assessed the impact to fishing grounds in detail.

The electromagnetic fields will be very weak and the impact on navigation or electronic equipment is considered to be minor.

Any cumulative or in-combination impact with the Beatrice Offshore Wind Farm export cable and other offshore developments are not considered to be significant given the distance from other developments. In addition, there is available sea room in the area and the installation phase of the project is unlikely to overlap with the construction phase of the Western Development Area.

13. REFERENCES

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