East Anglia
Offshore Wind

VATTENFALL

SCOTTISHPOWER
RENEWABLES

East Anglia THREE

Appendix 15.1

Annex 1

Navigational Risk Assessment
Hazard Log

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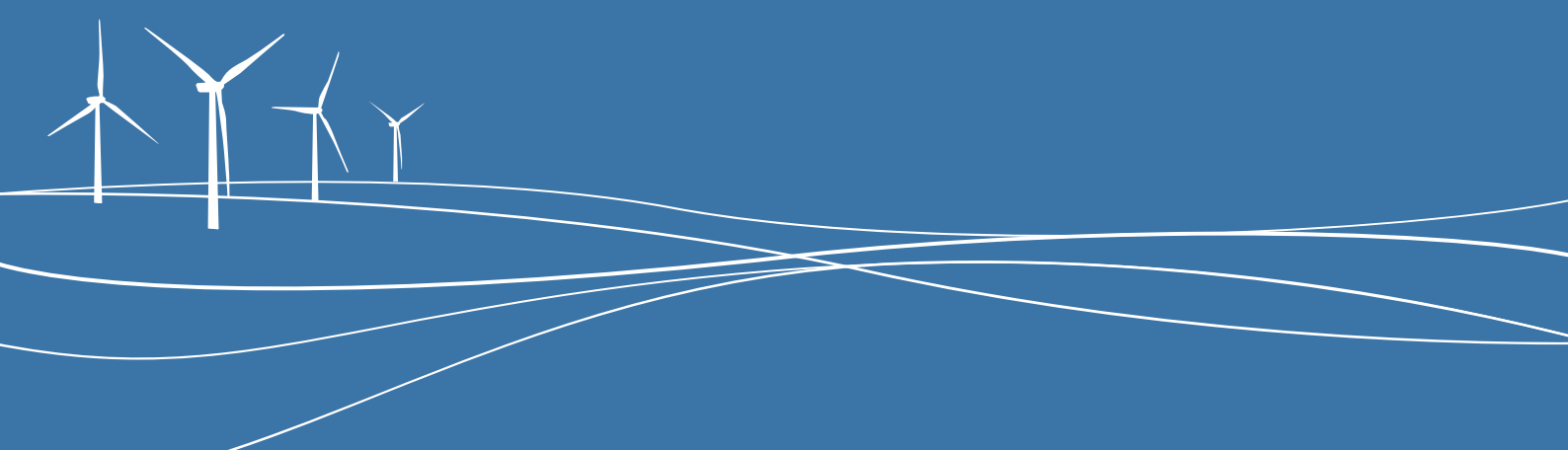

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East Anglia Offshore Wind

VATTENFALL

SCOTTISHPOWER RENEWABLES

Navigation Risk Assessment

East Anglia THREE Offshore Windfarm

Appendix 15.1

Annex 1

Hazard Log

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Presented to:	EATL
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1. Introduction

1. This report presents the preliminary Hazard Log for the navigational risks associated with the proposed East Anglia THREE windfarm within the East Anglia Round 3 Zone.

2. The workshop was held in London on 3 February 2014 attended by local maritime stakeholders, as outlined in Table 1.1.

Table 1.1 Hazard Review Workshop Attendees

Organisation	Attendees
Brown and May – Fisheries Consultants	Antoine Fry
Royal National Lifeboat Institute	Mike Oakes
DFDS	Stephen Fairlie
P&O Ferries	Grant Laversuch
Hanson Aggregates Marine	Nigel Griffiths
Cruising Association	Ted Osborn
	Peter Bury
Netherlands Fisheries	Andries De Boer
Belgian Fisheries	Sander Meyns
EATL	Colin Brown Rick Campbell
Anatec Ltd	Samantha Westwood Sandy Bendall Joanna Sowulewska

3. The following table notes those organisations that were invited to the workshop but could not attend.

Table 1.2 Hazard Review Workshop Invitees

Organisation
Royal Yachting Association
Chamber of Shipping
Cobelfret Ferries
Teekay Shipping (UK) Ltd
Union Transport Group PLC
UK Pilots Association

Europilots
MCA
Trinity House Lighthouse Services
Department for Transport
National Federation of Fishermen's Organisation
Bristow SAR

4. The following sections define the methodology to be used when undertaking the Hazard Workshop for identifying navigational risks associated with East Anglia Offshore Wind Farm in the southern North Sea. The methodology outlines the purpose of the workshop, the outline for the day and the process of identifying and assessing the hazards.
5. When assessing the risks associated with siting a new offshore wind farm development, as per the requirements of the Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 371 and the Department of Energy and Climate Change (DECC) 'Methodology for Assessing Marine Navigation Risk's', a Hazard Log must be produced to identify hazards that are introduced or altered by the development.
6. The level of risk associated with these hazards must be assessed and suitable risk reduction measures put in place when the risk level is too high, in order to bring it down to acceptable levels. It is essential that this is undertaken at this stage in the process so that hazards can be identified, risks can be assessed and risk reduction measures can be put in place, thus ensuring that the only risks remaining are those which have been defined as 'broadly acceptable' or those which are tolerable and being controlled to keep them 'As Low As Reasonably Practicable' (ALARP).
7. During the hazard workshop, vessel types were considered separately to ensure the risk levels are assessed for each type and that the risk reduction measures were identified on a type-specific basis, e.g., specific risk reduction measures for fishing vessels differ to those for commercial vessels. Different phases of a project (i.e. construction, operation & maintenance and decommissioning) were taken into account as some hazards may only be relevant within certain phases. The inclusion of hazards such as dropped objects and man overboard will help to create a more comprehensive, preliminary hazard log for the project.
8. In addition to creating the hazard log, another important element of the day is gaining input and gathering information from stakeholders who have local and site specific knowledge about the area surrounding the proposed development.

2. Objectives

9. The objectives of the hazard workshop are to:

- Identify the navigational risks associated with East Anglia THREE);

- Discuss possible causes;
- Assess the consequences of the scenario (most likely and worst case);
- Discuss mitigation measures; and
- Agree level of residual risk.

3. Example Causes

10. The following list suggests possible causes that could lead to any of the aforementioned hazards.

- Adverse weather
- Communication failure
- Design flaw
- Displacement of traffic
- Dragged anchor
- Equipment failure
- Failure to comply with COLREGS
- Fatigue
- Fire/ Explosion
- Fishing vessels attracted to site
- Gear snagging
- Human error
- Inadequate planning for installation
- Inadequately protected cable
- Lack of awareness
- Lack of experience
- Lack of passage planning
- Manoeuvring error
- Navigational aid failure
- On board navigational equipment failure
- Personal injury (slips, trips, falls, heart attack)
- Poor holding ground
- Poor visibility
- Protest
- Radar interference
- Steering gear failure
- Structural failure
- Taking on water
- Target not visible on radar
- Uncharted obstruction on seabed
- Vandalism
- Vessel not under command due to mechanical failure
- Vessels attracted to site
- Watch keeper failure

- Yacht becalmed

4. Consequence and Frequency Bands

11. The following tables show the consequence and frequency bands used within the assessment.

Table 4.1 Consequence Bands

Rank	Description	Definition			
		People	**Property**	**Environment**	**Business**
1	Negligible	No injury	<£10k No significant damage to infrastructure or vessel	<£10k	<10k No significant business, operation or reputation impacts
2	Minor	Slight injury(s)	£10k-£100k Minor damage to infrastructure or vessel	Tier 1 Local assistance required	£10k-£100k Minor business, operation or reputation impacts
3	Moderate	Multiple moderate or single serious injury	£100k-£10M Moderate damage to infrastructure or vessel	Tier 2 Limited external assistance required	£100k-£1M Considerable business, operation or reputation impacts
4	Serious	serious injury or single fatality	£10M-£100M Major damage to infrastructure or vessel	Tier 2 Regional assistance required	£1M-£10M Major national business, operation or reputation impacts
5	Major	More than 1 fatality	>£100M Extensive damage to infrastructure or vessel	Tier 3 National assistance required	>£10M Major international business, operation or reputation impacts

Table 4.2 Frequency Bands

Rank	Description	Definition
1	Negligible	< 1 occurrence per 10,000 years
2	Extremely Unlikely	1 per 100 to 10,000 years
3	Remote	1 per 10 to 100 years
4	Reasonably Probable	1 per 1 to 10 years
5	Frequent	Yearly

12. The four consequence scores will be averaged and multiplied by the frequency to obtain an overall ranking (or score) ranking which determined the hazard's position within the risk matrix shown below.

Table 4.3 Risk Matrix

Consequence						
	5					
	4					
	3					
	2					
	1					
		1	**2**	**3**	**4**	**5**
		Frequency				

13. Where the colours represent the following categories:

	Broadly Acceptable Region (Low Risk)	Generally regarded as insignificant and adequately controlled. None the less the law still requires further risk reductions if it is reasonably practicable. However, at these levels the opportunity for further risk reduction is much more limited.
	Tolerable Region (Intermediate Risk)	Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are as low as is reasonably practicable (ALARP) and that risks are periodically reviewed to see if further controls are appropriate.

	Unacceptable Region (High Risk)	Generally regarded as unacceptable whatever the level of benefit associated with the activity.

5. Example Mitigation Measures

14. The final stage of the process is to look at the risk reduction measures which can be put in place to reduce the risk rating of a hazard the following industry standard risk reduction measures are assumed to be in place:

- MGN 371
- IALA O-139
- Construction/Decommissioning Safety Zones
- RYAs Position on Offshore Renewable Energy Developments
- CDM Regulations
- SOLAS
- Standard Template ERCoP
- National Contingency Plan for Marine Pollution from Shipping and Offshore Installations

15. The following list presents a sample of suitable risk reduction measures:

- Abandon gear
- Adverse weather working policy and procedures
- AIS fitted on all workboats working within site
- AIS transceiver and receiver
- Anchoring by drifting vessel
- At work procedures
- Buoys marking navigational hazards
- Cable protection, e.g., burial
- CCTV Coverage
- CDM Regulations
- Compliance with COLREGS
- Continuous watch by multi-channel VHF, including DSC
- ECDIS - for equipped ships
- Emergency contact available 24hrs per day
- Emergency Response Cooperation Plan
- Emergency shutdown system
- Fenders/ bumper bollards installed on structures
- Fisheries Liaison
- Guard vessel during construction and decommissioning
- IMO Routeing Measures - new or amended
- Independent Verification
- Inspection and maintenance procedures
- Installation procedures
- Kingfisher publications
- Marine coordination

- Marine Operating Procedures
- Navigational information broadcasts
- Notice to Mariners
- Notices to Fishermen
- Passage plan to and from site
- Passage planning by vessels
- Personal Protective Equipment (PPE)
- Pilotage
- Planning of major activities
- Pollution response plans
- Procedures for all vessels working in the site
- Safety Management System
- Safety zones during construction
- Sharing of information within industry
- Site personnel trained in fire fighting
- Site personnel trained in first aid
- Site personnel trained in offshore survival
- Up-to-date charts
- Vessel traffic monitoring

6. Results for East Anglia THREE

16. Following the workshop a Hazard Log was developed and issued for consultation with those that attended as well as those organisations that were invited and could not attended. The following impacts for East Anglia THREE were identified.

- Commercial vessel (powered) allision with wind farm structure (C, O, D)
- Commercial vessel (drifting) allision with wind farm structure (C, O, D)
- Recreational craft allision with wind farm structure (C,O, D)
- Recreational craft collision with another vessel within wind farm array (O, D)
- Vessel-to-vessel collision due to avoidance of site or support vessels (C, O, D)
- Vessel anchoring on or dragging over subsea equipment (C, O, D)
- Vessel allision with partially constructed or deconstructed turbine (C, D)
- Unauthorised mooring to and/or deliberate damage to device (C, O, D)
- Unauthorised access to and/or deliberate damage to device (C, O, D)
- Access to structure in an emergency situation (C, O, D)
- Restricted emergency response in the wind farm in an emergency situation (C, O, D)
- Fishing vessel allision with wind farm structure (C, O, D)
- Fishing gear interaction with inter-array cabling (C, O, D)
- Fishing gear interaction with export cable (C, O, D)
- Fishing gear interaction with subsurface wind farm structure (C, O, D)
- Support vessel allision with wind farm structure (C, O, D)

- Man Overboard (C, O, D)

17. The following overall breakdown by tolerability region was assessed for the identified hazards.

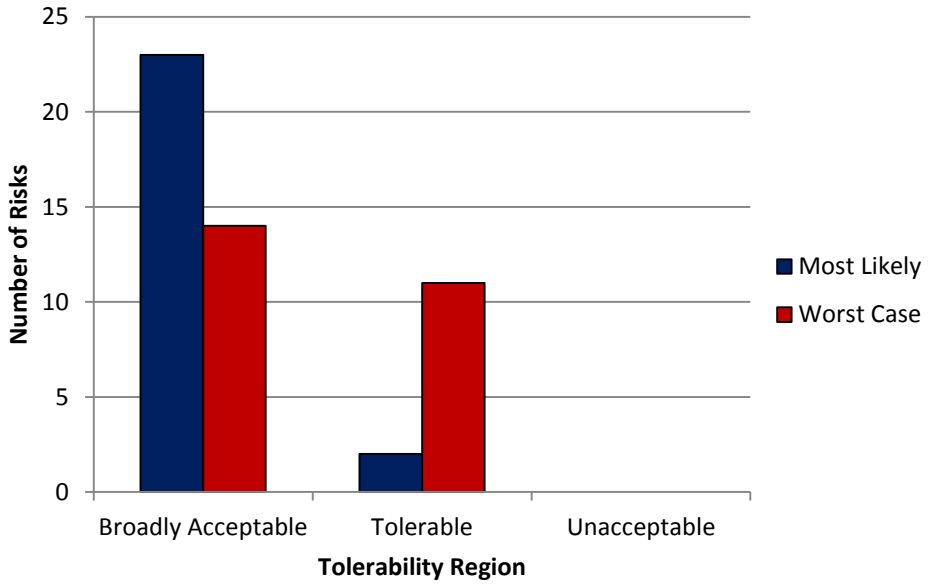

Figure 6.1 East Anglia THREE Hazard Ranking Results

18. No risks were assessed to be unacceptable. As shown in the above figure, two hazards were ranked within the Tolerable (As Low as Reasonably Practicable, ALARP) region based on the most likely outcome whilst eleven were ranked as Tolerable (ALARP) based on a realistic worst case outcome.

19. Full details of the logged and ranked hazards are summarised in Table 6.1.

Table 6.1 East Anglia THREE Hazard Ranking Results

Phase (C, O, D)	Category	Hazard Title	Hazard Detail	Possible Causes	Embedded Mitigation	Most Likely Consequence	Realistic Worst Case Consequence	Most Likely						Worst Case						Potential Risk Reduction	Remarks / Questions
								People	Environment	Property	Business	Frequency	Risk	People	Environment	Property	Business	Frequency	Risk		
C, O, D	Navigation Safety (Vessels)	Commercial vessel (powered) allision with wind farm structure	Oil Tanker	Adverse weather/poor visibility including the loss of adverse weather routes, communication or navigational equipment failure, site design not sympathetic to shipping, fatigue, human error, lack of awareness/experience	IMO conventions such as SOLAS, COLREGS, IALA 0-139, MGN 371, MGN 372, standard template ERCoP, standard marine practices such as notice to mariners	Slight / multiple injury to persons, moderate damage to vessel/infrastructure	Major consequence for persons, extensive damage to infrastructure/vessel, national environmental impact (oil tanker)	2	1	3	4	2	5.0	5	5	5	5	1	5	Site design giving consideration to navigation, advance and receptor specific information promulgation, consideration for self help and advanced emergency response capabilities, onsite marine coordination, consideration for adverse weather routes	Question raised specifics of VTS and areas to be avoided (precautionary areas); it was noted that this level of mitigation can only be considered at a national level.
			General Cargo					3	1	3	4	2	5.5	5	3	5	4	1	4.3		
			Passenger					4	1	3	4	2	6	5	3	5	5	1	4.5		
			Gas Carrier					3	1	3	4	2	5.5	5	4	5	5	1	4.8		
			Coaster					3	1	3	3	2	5	5	5	5	5	1	5		
C, O, D	Navigation Safety (Vessels)	Commercial vessel (drifting) allision with wind farm structure	Oil Tanker	Engine Failure; navigational equipment failure, Machinery Failure; Steering Gear Failure	IMO conventions such as SOLAS, COLREGS, MGN 373, vessel own emergency response plane, standard template ERCoP	Slight / multiple injury to persons, Minor or Moderate damage to vessel or infrastructure	Resulting from an allision and having major consequence for persons, extensive damage to infrastructure/vessel, national environmental impact (oil tanker)	2	1	2	4	2	4.5	5	5	5	5	1	5	Site design giving consideration to navigation, consideration for self help and advanced emergency response capabilities, onsite marine coordination,	Operators at the workshop considered vessel black out to be one of the most likely causes.
			General Cargo					3	1	3	4	2	5.5	5	3	5	4	1	4.3		
			Passenger					2	1	2	4	2	4.5	5	3	5	4	1	4.3		
			Gas Carrier					2	1	2	4	2	4.5	5	4	5	5	1	4.8		
			Coaster					2	1	2	2	2	3.5	5	5	5	5	1	5		
C, O, D	Navigation Safety (Recreational)	Recreational craft allision with wind farm structure	Recreational vessel allides with wind turbine or offshore substation.	Human error, adverse weather/poor visibility, Aid to Navigation failure, communication or navigational equipment failure Fatigue	IMO conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the RYA position paper, MGN 371, standard template ERCoP	Minor damage to vessel and potential for slight injury	Vessel allides with structure resulting in the potential major consequence for persons and minor damage to vessel and infrastructure.	2	1	2	2	2	3.5	5	1	2	2	1	2.5	Site design giving consideration for navigation, advance and specific promulgation of information, consideration for self help and advanced emergency response capabilities	Recreational craft in this area will tend to be those equipped for longer voyages. Most likely low energy impacts resulting in minor damage to vessel.
C, O, D	Navigation Safety (Recreational)	Recreational craft collision with another vessel within wind farm array	Recreational vessels collides with another vessel (most likely fishing or other small craft within wind farm array)	Human error, adverse weather/poor visibility, Aid to Navigation failure, communication or navigational equipment failure Fatigue, visual confusion associated with the turbine alignment, reduced detection of vessels by Radar	IMO conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the RYA position paper, MGN 371, standard template ERCoP	Collision resulting in minor damage to vessel and potential for slight injury	Vessel to vessel collision resulting in major injury to persons and major damage to vessel	2	1	2	2	2	3.5	5	1	4	2	1	3	Alignments of structures within wind farm ensure that both a vessels own location and other vessels locations with the array are easily identifiable.	Concern of visual confusion and increased collision risk associated with vessel navigating within the wind farm was raised by recreational users.

C, O, D	Navigation Safety (Vessels)	Vessel-to-vessel collision due to avoidance of site or support vessels	Displaced traffic increases congestion outside of the site. This can lead to an increase in vessel-to-vessel encounters and ultimately collisions.	Human error, adverse weather/poor visibility, Aid to Navigation failure, communication or navigational equipment failure Fatigue, visual confusion associated with the turbine alignment, reduced detection of vessels by Radar	IMO conventions such as SOLAS, COLREGS, IALA 0-139, MGN 371, MGN 372, standard template ERCoP, standard marine practices such as notice to mariners	Collision resulting in minor damage to vessel and potential for slight injury	Vessel to vessel collision resulting in major injury to persons and major damage to vessel	3	2	4	3	1	3	5	5	5	5	1	5	Site design giving consideration to navigation, advanced and receptor specific information promulgation, consideration for self help and advanced emergency response capabilities, onsite marine coordination, consideration for adverse weather routes	
C, O, D	Navigation Safety (Vessels)	Vessel anchoring on or dragging over subsea equipment	Vessel drops anchor over subsea equipment or a nearby vessel drags anchor over a subsea cable. Vessel may drop anchor over cable(s) in an emergency, i.e. machinery failure.	Human error, adverse weather, emergency scenario, uncharted cables/equipment on seabed; navigational equipment failure, engine failure/blackout, Dragged anchor, Sediment transport exposing and lifting cables	IMO conventions such as COLREGS, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting	Damage to cable(s), loss of anchor resulting in minor damage to vessel and moderate damage to property but unlikely to result in injury to persons	Major damage to cable(s) and therefore major business disruption, worth potential serious injury to persons	1	2	3	3	1	2.3	4	2	4	4	1	3.5	Cable burial and protection method consideration for crossing traffic, anchoring and fishing once the cable route is identified, advanced and receptor specific information , promulgation of information to local receptors	
C, D	Navigation Safety (Vessels)	Vessel allision with partially constructed or deconstructed turbine	During the construction and decommissioning stages, there could be an increased risk of vessels alliding with the turbines due to the fact that navigational aids (e.g. lights and markings) may not all be present.	Adverse weather/poor visibility including the loss of adverse weather routes, communication or navigational equipment failure, site design not sympathetic to shipping, fatigue, human error, lack of awareness, failure of temporary aids to navigation	IMO conventions such as SOLAS, COLREGS, IALA 0-139, MGN 371, MGN 372, standard template ERCoP, standard marine practices such as notice to mariners; rolling safety zones	Potential for moderate damage to vessel and infrastructure	Potential for major damage to vessel and infrastructure	3	1	3	4	1	2.8	5	5	5	5	1	5	Temporary aids to navigation in consultation with THLS, advance and receptor specific information promulgation, consideration for self help and advanced emergency response capabilities, onsite marine coordination and communication	
C, O, D	Navigation Safety (Access)	Unauthorised mooring to and/or deliberate damage to device	Vessels moor to the structure without the authority to do so and/or with the intention to cause damage to the device	Act of Protest or Vandalism		Potential for considerable operational impacts but unlikely to result in injury	Could result in serious injury to person, damage to property and operational impacts	1	1	1	3	1	1.5	4	1	2	3	1	2.5	n/a	
C, O, D	Navigation Safety (Access)	Unauthorised access to and/or deliberate damage to device	People access the structure without the authority to do so and/or with the intention to cause damage to the device	Act of Protest or Vandalism		Potential for considerable operational impacts but unlikely to result in injury	Could result in serious injury to person, damage to property and operational impacts	1	1	1	3	1	1.5	4	1	2	3	1	2.5	Promulgation of information to local users; Inspection and maintenance procedures; Emergency Response Cooperation Plan.	

C, O, D	Navigation Safety (Access)	Access to structure in an emergency situation	During emergency situations, a vessel may have to moor/secures itself to a wind farm structure	Emergency response incident	MGN 371 and the requirement to provide a safe place of refuge	Moderate potential for damage to a structure but limited potential for a minor injury and potential operational impacts	Person becomes stranded and unable to be recovered resulting in injury, moderate damage to structure and potential operational impacts	1	1	2	1	1	1.3	4	1	2	2	1	2.3	n/a	Additional facilities on board structures were considered but noted the potential additional risks (HSE), maintenance issues.
C, O, D	Navigation Safety (SAR ERCoP)	Restricted emergency response in the wind farm in an emergency situation	Access to the wind farm for search and rescue operations or other emergency may be affected by the presence of the wind farm structures	Restricted Sea Room, and Air space, Ineffective industry wide Emergency Response	Standard template ERCoP, SOLAS and MGN 371	Restricted but not ineffective emergency response capability	Loss of life due to restricted emergency response access	2	1	1	3	3	5.3	5	1	4	5	2	7.5	Consideration for emergency response in site and turbine design, self-help capability and advanced level ERCoP than currently produced.	
C, O, D	Navigation Safety (Fishing)	Fishing vessel allision with wind farm structure	Fishing vessel allides with wind farm structure whilst fishing in the area or steaming in transit.	Human error, adverse weather, emergency scenario, uncharted cables/equipment on seabed; navigational equipment failure, engine failure/blackout, Dragged anchor, Sediment transport exposing and lifting cables.	IMO conventions such as COLREGS, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting	Allision with structure resulting in minor damage to vessel and personnel	Vessel allides with structure resulting in the potential major consequence for persons and moderate damage to vessel and infrastructure.	3	1	2	2	2	4	5	2	3	4	1	3.5	Site design giving consideration to navigation, advance and receptor specific information promulgation, consideration for self help and advanced emergency response capabilities, onsite marine coordination, consideration for adverse weather routes	Fishing stakeholders noted they would have no objection to 50 metre safety zone; the application process of such was clarified.
C, O, D	Navigation Safety (Fishing)	Fishing gear interaction with inter-array cabling	There is the potential for fishing gear to interact with the subsea cabling i.e. Inter-array cables.	Uncharted obstruction on seabed, Lack of Awareness; sediment transport exposing / lifting cables; Human error; Fishing vessels attracted to site due to aggregation	IMO conventions such as COLREGS, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting	Loss of fishing gear, minimal damage to cables.	Potential for major consequences if the fishing vessel capsizes with loss of life, loss of vessel and pollution.	1	1	2	2	3	4.5	5	2	5	4	2	8	Cable burial and protection method consideration for crossing traffic, anchoring and fishing once the cable route is identified, advanced and receptor specific information , promulgation of information to local receptor (kingfishers); Chart Markings; of abandoned gear/dropped objects.	
C, O, D	Navigation Safety (Fishing)	Fishing gear interaction with export cable	Fishing vessel drags gear over export cable, e.g. scallop dredger or trawler	Uncharted obstruction on seabed, Lack of Awareness; sediment transport exposing / lifting cables; Human error	IMO conventions such as COLREGS, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting	Loss of fishing gear, minimal damage to cables.	Fishing vessel capsizes with loss of life, loss of vessel and pollution.	1	1	2	2	3	4.5	5	2	5	5	2	8.5	Cable burial and protection method consideration for crossing traffic, anchoring and fishing once the cable route is identified, advanced and receptor specific information , promulgation of information to local receptor (kingfishers); Chart Markings; of abandoned gear/dropped objects.	

C, O, D	Navigation Safety (Fishing)	Fishing gear interaction with subsurface wind farm structure	Fishing vessel drags gear and snags with turbine foundations. Dependent on foundation type selected.	Uncharted obstruction on seabed, Lack of Awareness; sediment transport exposing / lifting cables; Human error; Fishing vessels attracted to site due to aggregation	IMO conventions such as COLREGS, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting	Loss of fishing gear, minimal damage to equipment.	Fishing vessel capsizes with loss of life, loss of vessel and pollution.	1	1	2	2	3	4.5	5	2	4	4	2	7.5	Consideration for snagging risk when selecting scour protection and design of final turbines	
C, O, D	Navigation Safety (Wind farm support vessels)	Support vessel allision with wind farm structure	Vessels will be working in proximity to the structures, e.g., during construction and maintenance. Misjudgement, weather or equipment failure could lead to an allision	Poor Visibility; Manoeuvring error; Machinery Failure; Lack of Passage Planning; Lack of experience; Lack of awareness; Human error; Fatigue; Engine Failure/ Blackout; Bad weather.	IMO conventions such as SOLAS, COLREGS, IALA 0-139, MGN 371, MGN 372, standard template ERCoP, standard marine practices such as notice to mariners	Minor damage to vessel and potential for minor injury	High speed impact that results in major damage to vessels and consequences for personnel. Could also lead to major damage to vessel.	2	1	2	2	4	7	5	2	4	4	2	7.5	Site design giving consideration to navigation, advance and receptor specific information promulgation, consideration for self help and advanced emergency response capabilities, onsite marine coordination, adverse weather and visibility procedures	
C, O, D	Navigation Safety (Wind farm support vessels)	Man Overboard	Man overboard scenario within the wind farm from either a wind farm work craft or a third party vessel.	Recovery of person/s from the water during man overboard incident	IMO conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the RYA position paper, MGN 371, standard template ERCoP	Man overboard from support /wind farm operational vessels within the wind farm resulting in no injury	Multiple persons in the water from a large vessel with the potential for serious injury to persons from an inability to adequately undertake SAR.	1	1	1	1	1	1	4	1	4	1	1	2.5	Site design to give consideration to SAR response in line with MCA guidance, consideration for self help and advanced emergency response capabilities, onsite marine coordination,	

Appendix 15.1 ends here

Appendix 15.1b) ends here