East Anglia THREE

Appendix 15.1
Annex 1

Navigational Risk Assessment
Hazard Log
Document Reference – 6.3.15 (1b)

Author – Anatec Limited
East Anglia THREE Limited
Date – November 2015
Revision History – Revision A
Navigation Risk Assessment
East Anglia THREE Offshore Windfarm
Appendix 15.1
Annex 1
Hazard Log

Prepared by: Anatec Limited
Presented to: EATL
Date: November 2015
Revision No.: 03
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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

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

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

Table 1.2 Hazard Review Workshop Invitees

<table>
<thead>
<tr>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Yachting Association</td>
</tr>
<tr>
<td>Chamber of Shipping</td>
</tr>
<tr>
<td>Cobelfret Ferries</td>
</tr>
<tr>
<td>Teekay Shipping (UK) Ltd</td>
</tr>
<tr>
<td>Union Transport Group PLC</td>
</tr>
<tr>
<td>UK Pilots Association</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
<th>Definition</th>
<th>People</th>
<th>Property</th>
<th>Environment</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
<td>No injury</td>
<td>&lt;£10k</td>
<td>No</td>
<td>&lt;£10k</td>
<td>&lt;10k</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>significant</td>
<td>no significant</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>damage to</td>
<td>damage to infrastructure or vessel</td>
<td>business, operation or reputation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>infrastructure or vessel</td>
<td></td>
<td>impacts</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>Slight injury(s)</td>
<td>£10k-£100k</td>
<td>Minor damage to infrastructure or vessel</td>
<td>Tier 1</td>
<td>Local assistance required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minor business, operation or reputation</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Multiple moderate or single serious injury</td>
<td>£100k-£1M</td>
<td>Moderate damage to infrastructure or vessel</td>
<td>Tier 2</td>
<td>Limited external assistance required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Considerable business, operation or reputation</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Serious</td>
<td>serious injury or single fatality</td>
<td>£10M-£100M</td>
<td>Major damage to infrastructure or vessel</td>
<td>Tier 2</td>
<td>Regional assistance required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Major national business, operation or reputation</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Major</td>
<td>More than 1 fatality</td>
<td>&gt;£100M Extensive damage to infrastructure or vessel</td>
<td>Tier 3</td>
<td>National assistance required</td>
<td>&gt;£10M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Major international business, operation or reputation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>impacts</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.2  Frequency Bands

<table>
<thead>
<tr>
<th>Rank</th>
<th>Description</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
<td>&lt; 1 occurrence per 10,000 years</td>
</tr>
<tr>
<td>2</td>
<td>Extremely Unlikely</td>
<td>1 per 100 to 10,000 years</td>
</tr>
<tr>
<td>3</td>
<td>Remote</td>
<td>1 per 10 to 100 years</td>
</tr>
<tr>
<td>4</td>
<td>Reasonably Probable</td>
<td>1 per 1 to 10 years</td>
</tr>
<tr>
<td>5</td>
<td>Frequent</td>
<td>Yearly</td>
</tr>
</tbody>
</table>

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

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.

![Tolerability Region Chart]

**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

<table>
<thead>
<tr>
<th>Phase (C, O, D)</th>
<th>Category</th>
<th>Hazard Title</th>
<th>Hazard Detail</th>
<th>Possible Causes</th>
<th>Embedded Mitigation</th>
<th>Most Likely Consequence</th>
<th>Realistic Worst Case Consequence</th>
<th>Potential Risk Reduction</th>
<th>Remarks / Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>C, O, D</td>
<td>Navigation Safety (Vessels)</td>
<td>Commercial vessel (powered) allision with wind farm structure</td>
<td>Oil Tanker</td>
<td>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</td>
<td>IMOA conventions such as SOLAS, COLREGS, IALA-8-159, MGN 371, standard template ERCOF, standard marine practices such as notice to mariners</td>
<td>Slight / multiple injury to persons, moderate damage to vessel/infrastructure</td>
<td>Major consequence for persons, remote environmental damage to infrastructure/vessel, national environmental impact (oil tanker)</td>
<td>2 1 3 4 5</td>
<td>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</td>
</tr>
<tr>
<td>C, O, D</td>
<td>Navigation Safety (Vessels)</td>
<td>Commercial vessel (drifting) allision with wind farm structure</td>
<td>Oil Tanker</td>
<td>Engine Failure, navigational equipment failure, Machinery Failure, Steering Gear Failure</td>
<td>IMOA conventions such as SOLAS, COLREGS, MGN 275, vessel own emergency response plan, standard template ERCOF</td>
<td>Slight / multiple injury to persons, Minor or Moderate damage to vessel or infrastructure</td>
<td>Resulting from an allision and having major consequence for persons, extensive damage to infrastructures/vessels, national environmental impact (oil tanker)</td>
<td>2 1 3 4 5</td>
<td>Site design giving consideration to navigation, consideration for self help and advanced emergency response capabilities, create marine coordination, Procedures at the workshop considered vessel black out to be one of the most likely causes.</td>
</tr>
<tr>
<td>C, O, D</td>
<td>Navigation Safety (Recreational)</td>
<td>Recreational vessel allision with wind turbine or offshore substation</td>
<td>Recreational</td>
<td>Human error, adverse weather/poor visibility, Aid to Navigation failure, communication or navigational equipment failure, Fatigue</td>
<td>IMOA conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the PVA position paper, MGN 371, standard template ERCOF</td>
<td>Minor damage to vessel and potential for slight injury</td>
<td>Vessel allides with structure resulting in the potential major consequence for persons and minor damage to vessel and infrastructure.</td>
<td>2 1 2 3 4 5</td>
<td>Site design giving consideration for navigation, advance and specific promulgation of information, consideration for self help and advanced emergency response capabilities</td>
</tr>
<tr>
<td>C, O, D</td>
<td>Navigation Safety (Recreational)</td>
<td>Recreational vessel collision with another vessel within wind farm array</td>
<td>Recreational</td>
<td>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</td>
<td>IMOA conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the PVA position paper, MGN 371, standard template ERCOF</td>
<td>Collision resulting in minor damage to vessel and potential for slight injury</td>
<td>Vessel allides with another vessel resulting in the major injury to persons and major damage to vessel</td>
<td>1 2 3 4 5</td>
<td>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.</td>
</tr>
</tbody>
</table>

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| C. 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. | IMC conventions such as SOLAS, COLREGS, IALA R-108, 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 serious damage to vessel. | 3 | 2 | 4 | 1 | 1 | 1 | 1 | 5 | 5 | 3 | 3 | 3 | 3 |

| C. D. | Navigation Safety (Vessels) | Vessel anchoring on or dragging over subsea equipment | Vessel drops anchor over subsea equipment or a nearby vessel, drags anchor or 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. | IMC 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 | 1 | 2.5 | 4 | 2 | 4 | 4 | 1 | 3.5 |

| 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 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. | IMC conventions such as SOLAS, COLREGS, IALA R-108, 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. | 1 | 1 | 4 | 1 | 3.5 | 5 | 2 | 5 | 3 | 3 | 3 |

| C. 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 personnel, damage to property and operational impacts. | 1 | 1 | 3 | 1 | 1.5 | 4 | 1 | 2 | 3 | 1 | 2.5 |

| C. 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 personnel, damage to property and operational impacts. | 1 | 1 | 3 | 1 | 1.5 | 4 | 1 | 2 | 3 | 1 | 2.5 |

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.

Temporary aids to navigation in consultation with THL, advance and receptor specific information promulgation, consideration for self help and advanced emergency response capabilities, onsite marine coordination and communication.

Temporary aids to navigation and/or drag anchor specific information - promulgation of information to local receptors.
| C, O, D | Navigation Safety (Access) | Access to structure in an emergency situation | During emergency situations, a vessel may have to maneuver itself to a wind farm structure | Emergency response incident | MSN 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 | 5 | 4 | 1 | 2 | 2 | 1.9 | n/a | n/a |
| 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 MSN 371 | Restricted but not ineffective emergency response capability | Loss of life due to restricted emergency response access | 2 | 1 | 1 | 1.5 | 5 | 1 | 4 | 5 | 2 | 1.5 | 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 allision with wind farm structure whilst fishing in the area or streaming in transit. | Human error, adverse weather, emergency scenario, unchartered cables/equipment on seabed, navigational equipment failure, engine failure/machinery, Dragged anchor, Sediment transport exposing and lifting cables. | IMC conventions such as COLREG, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting | Avoid allision with structure resulting in minor damage to vessel and personnel | Vessel allision with structure resulting in the potential major consequence for persons and moderate damage to vessel and infrastructure. | 3 | 1 | 2 | 2 | 5 | 2 | 4 | 5 | 3 | 1.5 | Site design giving consideration to navigation, advance and receptor specific information promulgation, consideration for self-halt and advanced emergency response capabilities, onsite marine coordination, consideration for adverse weather routes. |
| 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. | Unexpected obstruction on seabed. Lack of Awareness, Sediment transport exposure / lifting cables; Human error; Fishing vessels attracted to site due to aggregation. | IMC conventions such as COLREG, 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 self-propels in the event of loss of life, loss of vessel and pollution. | 1 | 1 | 2 | 2 | 5 | 2 | 4 | 5 | 3 | 1.5 | 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 (knots/hour). Chart Markings of abandoned gear/dropped objects, |
| C, O, D | Navigation Safety (Fishing) | Fishing gear interaction with export cable | Fishing vessel drag gear over export cable, e.g. scallop dredger or towier | Unexpected obstruction on seabed. Lack of Awareness, Sediment transport exposure / lifting cables; Human error | IMC conventions such as COLREG, standard marine good practice, standard template ERCoP, Vessels own emergency response plans; UKHO charting | Loss of fishing gear, minor damage to cables. | Fishing vessel capsize with loss of life, loss of vessel and pollution. | 1 | 1 | 2 | 2 | 5 | 2 | 4 | 5 | 3 | 1.5 | 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 (knots/hour). Chart Markings of abandoned gear/dropped objects, |

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<table>
<thead>
<tr>
<th>C.O.D</th>
<th>Project</th>
<th>Client</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.4</td>
<td>A2953</td>
<td>EATL</td>
<td>Navigation Risk Assessment – East Anglia THREE – Annex 15.1.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.O.D</th>
<th>Navigation Safety (Fishing)</th>
<th>Fishing gear interaction with subsea wind farm structure</th>
<th>Unintended obstruction on seabed, Lack of Awareness; sediment transport exposure; lifting cables; Human error; Fishing vessels attracted to site due to aggregation.</th>
<th>IMO conventions such as COLREGS, standard marine good practice, standard template ERCoP, Vessels own emergency response plans, UKHO charting</th>
<th>Loss of fishing gear, minimal damage to equipment.</th>
<th>Fishing vessel capsizes with loss of life, loss of vessel and pollution.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.4</td>
<td>Fishing vessel</td>
<td>Fishing gear and ships with turbine foundations, dependent on foundation type selected.</td>
<td>Poor visibility, Maneuvering error; Machinery Failure; Lack of Passage Planning; Lack of experience; Lack of awareness; Human error; Fatigue; Engine Failure; Blackout; Bad weather.</td>
<td>IMO conventions such as SOLAS, COLREGS, ILA/9-139, MN371, MN372, standard template ERCoP, standard marine practices such as notice to mariners</td>
<td>Minor damage to vessel and potential for minor injury.</td>
<td>High speed impact that results in major damage to vessels and consequences for personnel. Could also lead to major damage to vessel.</td>
</tr>
<tr>
<td>1.2.4</td>
<td>Navigation Safety (Wind farm support vessels)</td>
<td>Support vessel allision with wind farm structure</td>
<td>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.</td>
<td>IMO conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the RYA position paper, MN371, standard template ERCoP</td>
<td>Minor damage to vessel and potential for minor injury.</td>
<td>High speed impact that results in major damage to vessels and consequences for personnel. Could also lead to major damage to vessel.</td>
</tr>
<tr>
<td>1.2.4</td>
<td>Navigation Safety (Wind farm support vessels)</td>
<td>Man Overboard</td>
<td>Man overboard scenario within the wind farm from either a wind farm work craft or a third party vessel.</td>
<td>IMO conventions such as COLREGs, Compliance with coding/regulation specific for vessel type, consideration of the RYA position paper, MN371, standard template ERCoP</td>
<td>Man overboard from support wind farm operational vessels within the wind farm resulting in no injury.</td>
<td>Multiple persons in the water from a large vessel with the potential for serious injury to persons from an inability to adequately undertake SAR.</td>
</tr>
</tbody>
</table>

Appendix 15.1 ends here

Appendix 15.1b) ends here