MORAY EAST
OFFSHORE WINDFARM

Safety Zone Application

Including Supporting Safety Case

March 2019

Moray Offshore Windfarm (East) Limited

Produced by Anatec Limited on behalf of Moray Offshore Windfarm (East) Limited	
Produced by	Anatec Limited
Document Status	Final (Version 2)
File Name	8460001-PPL0050-ANA-REP-001
Date	01/03/2019

Review / Approval

Moray East Ecological Clerk of Works	**Legal Review**
[redacted] [Royal Haskoning DHV]	[redacted] [Shepherd and Wedderburn]

Moray East		
[redacted]	[redacted]	[redacted]

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AC	Alternating Current
AIS	Automatic Identification System
AtoN	Aids to Navigation
CCTV	Closed Circuit Television
CLV	Cable Lay Vessel
CMS	Construction Method Statement
COLREGs	International Regulations for the Prevention of Collisions at Sea
CP	Construction Programme
DP	Dynamic Positioning
DSLP	Development Specification and Layout Plan
ERCoP	Emergency Response Cooperation Plan
ERP	Emergency Response Plan
FLO	Fisheries Liaison Officer
HAT	Highest Astronomical Tide
HLV	Heavy Lift Vessel
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
IMO	International Maritime Organization
IPS	Intermediate Peripheral Structure
JUP	Jack-up Construction Vessel
kV	Kilovolt
L	Long [navigational light identification]
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan
m	Metre
MCC	Marine Coordination Centre
MW	Megawatt
MORL	Moray Offshore Renewables Limited
NLB	Northern Lighthouse Board
nm	Nautical Mile
NRA	Navigational Risk Assessment
NSP	Navigational Safety Plan
OfTI	Offshore Transmission Infrastructure
OSP	Offshore Substation Platform
PLGR	Pre-lay Grapnel Run

PSV	Platform Supply Vessel
Q	Quick [navigational light identification]
RAM	Restricted in Ability to Manoeuvre
ROV	Remotely Operated Vehicle
s	Second
SCADA	Supervisory Control and Data Acquisition
SOLAS	Safety of Life at Sea
SOP	Standard Operating Procedures
SOV	Service Operations Vessel
SPS	Significant Peripheral Structure
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
V	Very [navigational light identification]
VHF	Very High Frequency
VMP	Vessel Management Plan
W	White [navigational light identification]
WROV	Work Class Remotely Operated Vehicle
WTG	Wind Turbine Generator
Y	Yellow [navigational light identification]

Definitions

The following definitions have been used throughout this document with respect to the company, the consented wind farms and how these definitions have changed since submission of the Moray East Environmental Statement (ES) in 2012 and the Modified Transmission Infrastructure ES in 2014.

- **Moray Offshore Windfarm (East) Limited (formerly known as Moray Offshore Renewables Limited and hereinafter referred to as Moray East)** – the legal entity submitting this Safety Zone Application;
- **Moray East Offshore Wind Farm** - the wind farm to be developed in the Moray East site (also referred as the Wind Farm);
- **The Moray East site** - the area in which the Moray East Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licences to develop and operate up to three generating stations on the Moray East site were granted in March 2014. At that time the Moray East site was known as the "Eastern Development Area (EDA)" and was made up of three sites known as the Telford, Stevenson and MacColl offshore wind farm sites; The Section 36 Consents and Marine Licences were subsequently varied in March 2018;
- **Telford, Stevenson and MacColl wind farms** – these names refer to the three consented offshore wind farm sites located within the Moray East site;
- **Transmission Infrastructure (TI)** - includes both offshore and onshore electricity transmission infrastructure for the consented Telford, Stevenson and MacColl wind farms. Includes connection to the national electricity transmission system near New Deer in Aberdeenshire encompassing AC offshore substation platforms (OSPs), AC OSP interconnector cables, AC export cables offshore to landfall point at Inverboyndie continuing onshore to the AC collector station (onshore substation) and the additional regional Transmission Operator substation near New Deer. A Marine Licence for the offshore TI was granted in September 2014 and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017.The onshore TI was awarded Planning Permission in Principle in September 2014 by Aberdeenshire Council and a Planning Permission in Principle under Section 42 in June 2015;
- **Offshore Transmission Infrastructure (OfTI)** – the offshore elements of the transmission infrastructure, comprising AC OSPs, OSP inter-connector cables and AC export cables offshore to landfall (for the avoidance of doubts some elements of the OfTI will be installed in the Moray East site);
- **Moray East ES 2012** – The ES for the Telford, Stevenson and MacColl wind farms and Associated Transmission Infrastructure, submitted August 2012;
- **Moray East Modified TI ES 2014** – the ES for the TI works in respect to the Telford, Stevenson and MacColl wind farms, submitted June 2014;
- **The Development** – the Moray East Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI);
- **Design Envelope** - the range of design parameters used to inform the assessment of impacts; and
- **OfTI Corridor** – the export cable route corridor, i.e. the OfTI area as assessed in the Moray East Modified TI ES 2014 excluding the Moray East site.

- **Moray East Offshore Wind Farm Consents** – are comprised of the following:

  Section 36 Consents:

  - Section 36 consent for the Telford Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the Telford Offshore Wind Farm assigned to Moray East on 19 June 2018.
  - Section 36 consent for the Stevenson Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the Stevenson Offshore Wind Farm assigned to Moray East on 19 June 2018.
  - Section 36 consent for the MacColl Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the MacColl Offshore Wind Farm assigned to Moray East on 19 June 2018.

  Marine Licences

  - Marine Licence for the Telford Offshore Wind Farm (as varied) – Licence Number: 04629/18/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for the Stevenson Offshore Wind Farm (as varied) – Licence Number: 04627/18/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for the MacColl Offshore Wind Farm (as varied) – Licence Number: 04628/18/2 - consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.

- **OfTI Licences** – are comprised of the following:
  - Marine Licence for the Offshore Transmission infrastructure – Licence Number 05340/14/0 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OfTI Marine Licence").
  - Marine Licence for two additional distributed OSPs – Licence Number 06347/17/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction, operation and maintenance works and the deposit of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OSP Marine Licence").

Executive Summary

This Safety Zone Application has been prepared to provide a case to Marine Scotland (who administer such applications on behalf of the Scottish Ministers) for the use of safety zones at the Moray East Offshore Wind Farm and associated offshore transmission infrastructure (OfTI) (together known as the Development) as per Section 95 and Schedule 6 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 respectively.

This Safety Zone Application outlines the types of safety zone which are being applied for and provides a summary of the various infrastructure and works which shall be undertaken whilst safety zones are in place. Lighting and marking to be implemented during the construction and operation and maintenance phases are considered as is a validation of the Automatic Identification System (AIS) and Radar data submitted as part of the Navigational Risk Assessment (NRA) in 2010.

A safety case has been made to justify this application for safety zones by summarising the potential risks associated with the Development The potential impacts arising due to the presence of safety zones have been identified, and the promulgation, monitoring and policing of safety zones has been outlined.

1 Introduction

1.1 Background

In March 2014, subsidiaries of Moray Offshore Windfarm (East) Limited (Moray East), formerly known as Moray Offshore Renewables Limited (MORL), received consent from the Scottish Ministers under Section 36 of the Electricity Act 1989, and at the same time were granted associated Marine Licences under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, for the construction and operation of the Moray East Offshore Wind Farm (hereafter referred to as the 'Development'). At that time the development area (the Moray East site) was known as the "Eastern Development Area" and was made up of three sites known as the "Telford", "Stevenson" and "MacColl" offshore wind farm sites. In March 2018 the Section 36 consents were varied together with the relevant Marine Licences. The Section 36 licences and Wind Farm Marine Licences were assigned / transferred to Moray East in June and July 2018 respectively.

A Marine Licence (under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009) was granted in September 2014 for the offshore Transmission Infrastructure (OfTI) and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017 (together these are referred to as the OfTI Licences).

Moray East is a joint venture partnership between EDP Renewables, Engie and Diamond Generating Europe, and has been established to develop, finance, construct, operate, maintain and decommission the Moray East Offshore Wind Farm.

The Moray East site is located approximately 12 nautical miles (nm) southeast the Caithness coast and 22 nm north of Portknockie on the Moray coast. Three subsea export cable circuits shall be installed and shall make landfall at Inverboyndie Bay in Aberdeenshire. Further details of the Moray East Offshore Wind Farm and associated offshore transmission infrastructure (OfTI) (together known as the Development) are provided in Section 3.

1.2 Objectives of this Document

As per Section 95 and Schedule 16 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 respectively, a Safety Zone Application can be made to Marine Scotland for the Development. Anatec Limited has been commissioned by Moray East to prepare this Safety Zone Application.

The safety zones which are proposed in the following subsections are designed to manage potential interactions between third party vessels and the Moray East construction and maintenance activities, with a view to securing the safety of the assets and other installations, individuals and vessels in their vicinity. It is noted that an application is being made only for surface infrastructure associated with the Wind Farm and the OfTI (i.e. the offshore substation platforms (OSPs) which will be located within the Moray East site).

1.2.1 Construction Phase

The following safety zones are being applied for during the construction phase:

- Mandatory "rolling" 500 metres (m) safety zones established around each wind farm or OfTI structure (both Wind Turbine Generators (WTG) and OSPs) and/or their foundations whilst construction works are in progress, as indicated by the presence of a construction vessel (including Service Operation Vessels (SOV) whilst displaying Restricted in their Ability to Manoeuvre (RAM) status). Triggering of the safety zone will only include the SOV when it is

attached to or on station[1] next to a structure. It is expected that no more than three of these 500 m safety zones will be active at any one time.

- Mandatory pre commissioning 50 m safety zones established around each wind farm or OfTI structure (both WTGs and OSPs) and/or their foundations when construction works have been completed but prior to the commissioning of the Development or where construction works have only been partially completed. Up to 103 of the 50 m safety zones will be active at any given time, given that the Development will comprise of 100 WTGs and three OSPs.

1.2.2 Operation and Maintenance Phase

The following safety zones are being applied for during the operation and maintenance phase:

- Mandatory 500 m safety zones around all "major maintenance" work being undertaken. Major maintenance is defined as any activity involving large vessels such as Jack-up Construction Vessels (JUP), floating barges and Heavy Lift Vessels (HLV) which are RAM. Major maintenance includes the use of SOVs displaying RAM status. Triggering of the safety zone will only include the SOV when it is attached to or on station next to a structure. It is expected that no more than one 500 m major maintenance safety zone around an SOV will be active at any one time.

1.2.3 Decommissioning Phase

Safety zones for the decommissioning phase of the Development shall be applied for separately, prior to any such operations taking place.

[1] On station means that a vessel is using its navigation and propulsion systems to hold position at a specific and precise geographical location. The SOV is an example of this whereby it will use its dynamic positioning systems (including thrusters and propellers) to manoeuvre and hold in position alongside a structure. This system is more advanced than a vessel using its anchors, noting that in the case of Moray East the proposed SOV only has forward anchors, meaning that it would not be able to maneuver itself into close proximity to the structure using the anchors given the effects of tide and weather (i.e. anchor swing).

2 Compliance with Relevant Legislation

Schedule 16 of the Energy Act 2004 requires specific information is included within any application for safety zones submitted under Section 95. Table 2.1 summarises the requirements, and provides reference to where each is addressed within this application.

Table 2.1: Energy Act 2004 Schedule 16 Applications and proposals for notices under section 95 – completion of requirement

Item	Requirement	Where Addressed within this Document
3(1) An application for a safety zone notice must describe, by way of a map –	(a) The place where the relevant renewable energy installation is to be, or is being, constructed, extended, operated or decommissioned. (b) The waters in relation to which any declaration applied for will establish a safety zone.	Figure 3.1 and Figure 3.2 provide the location of the Development and installations on United Kingdom Hydrographic Office (UKHO) Admiralty Charts. Figure 3.1 and Figure 3.2 provide details relating to the waters within and in proximity to the Development on UKHO Admiralty Charts.
3(2) The application must also –	(a) Describe the other provisions the application asks to be included in the notice applied for; and (b) Include such other information as may be prescribed by regulations made by the appropriate minister[2].	Requirements under the Electricity Regulations 2007 are outlined in Table 2.2.
3(3)	An application is not allowed to be made orally.	This document constitutes a written application to Marine Scotland.

Table 2.2 summarises where the relevant requirements from the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 has been addressed within this document. It is noted that Marine Scotland has responsibility for all applications received after 1st April 2017 (powers transferred from BEIS under Section 62 of the Scotland Act 2016) and their own Standard Operating Procedures (SOP) have also been considered (which are based on the Electricity Regulations 2007).

[2] It should be noted that the applications is being made to Marine Scotland.

Table 2.2: Compliance with the Electricity Regulations 2007

Item	Requirement	Where Addressed within this Document
3. An application for the declaration under section 95(2) of a safety zone must include the following information (in addition to that required by paragraph 3(1) and 3(2)(a) of Schedule 16)— (a) In relation to any proposed or existing relevant renewable energy installation –	(i) A description of the installation and its proposed or existing location and dimensions (including an explanation of how much of it is (or is expected to be) visible above the water line and how much below it), supported by drawings. (ii) A description of how the installation operates (or is to operate).	The locations of the installations are provided in Figure 3.2. A description of the various components required is provided in Section 4 and includes key properties for each type of infrastructure. Overviews of processes during the construction phase and operation and maintenance phase is provided in Section 6 and Section 7, respectively.
	(iii) A description of the location (or proposed location) of— (aa) Any electric line used (or proposed to be used) for the conveyance of electricity to or from the installation; and (bb) Any connection to such an electric line.	A description of cabling for the Development including export cables, inter-array cables and inter-connector cables is provided in Section 5.4.
	(iv) A description of the location (or proposed location) of any offshore sub-station housing connection equipment.	The locations of the OSPs are provided in Figure 3.2.
	(v) Where the zone is sought in respect of more than one relevant renewable energy installation, the proposed or existing distances between such installations.	Proposed distances (which will be in excess of minimum spacing) between installations are provided in Section 3.1 .
	(vi) Details of any navigational marking that has been specified for use with an installation of the description in question by a general lighthouse authority.	Details of navigational lighting and marking to be implemented during the construction and operation and maintenance phases are outlined in Section 9.
3(c) In relation to the proposed safety zone –	(i) Whether the zone relates to the construction, extension, operation or decommissioning of the relevant renewable energy installation.	The safety zones to be applied for (including the relevant phases) are stated in Section 1.2.
	(ii) Whether the applicant seeks the declaration of a standard safety zone, or if not, what dimensions are sought for that zone.	The safety zones to be applied for (including the dimensions) are stated in Section 1.2.
	(iii) A description of those works or operations in respect of which the zone is being applied for and their estimated date and duration.	The safety zones to be applied for (including the related work) are stated in Section 1.2. The scheduled dates for construction processes are provided in Section 3.2.

Item	Requirement	Where Addressed within this Document
	(iv) Whether the applicant proposes that the area of the zone will vary and any factors or determinations by reference to which the applicant proposes that such variation may take place.	Not applicable to the Development.
	(v) Whether the zone relates to major maintenance works in respect of a relevant renewable energy installation which has become operational.	The safety zones to be applied for include zones for major maintenance activities as stated in Section 1.2.
	(vi) A statement setting out what steps, if any, the applicant proposes to take to monitor vessels and activities within the zone.	Planned monitoring is outlined in Section 13.2.
	(vii) Except where the Secretary of State has notified the applicant that it is not required, an up to date shipping traffic survey for the waters comprising the zone.	A review of Automatic Identification System (AIS) data for the area recorded in 2018 has been undertaken and is discussed in Section 10.
3(d)	An assessment of the extent to which navigation might be possible or should be restricted, and whether restrictions would cause navigational problems, within or near waters where the relevant renewable energy installation is to be, or is being, constructed, extended, operated or decommissioned, as the case may be.	A risk assessment for safety zones is provided in Section 11 and potential navigational risks due to the presence of the safety zones are identified and assessed in Section 12.
4(1) The applicant shall publish notice of an application—	(a) In two successive weeks in one or more local newspapers which are likely to come to the attention of those likely to be affected by the safety zone. (b) In *Lloyd's List* and in one or more national newspapers. (c) If there are in circulation one or more appropriate fishing trade journals which are published at intervals not exceeding one month, in at least one such trade journal.	Notice of the application shall be published in the following: 1. Press and Journal (local newspaper); 2. Lloyd's List; 3. Scotsman (national newspaper); 4. Fishing News; 5. Kingfisher; and 6. Edinburgh Gazette

Item	Requirement	Where Addressed within this Document
	(e)[3] In the case of an application relating to a safety zone proposed or located wholly or partly in an area of Scottish waters or an area of waters in the Scottish part of the Renewable Energy Zone(1), the *Edinburgh Gazette*.	
4(2) The applicant shall, at the same time as publishing the notice under paragraph (1)(a), send a copy of the notice to— —requesting that the notice be displayed for a period of not less than 14 days at an address accessible during normal office hours to members of the public likely to be affected by the application.	(a) The harbour masters of ports whose users are in the opinion of the applicant likely to be affected by the application.	Notice of the application shall be sent to the following local harbour masters: • Banff; • Invergordon; • Lossiemouth; • Macduff; • Nairn; and • Wick.
	(b) The sector office of the Maritime and Coastguard Agency which is responsible for operations in the waters in which the safety zone is proposed or located	Aberdeen Coastguard Operations Centre under the remit of the Offshore Renewable Energy Liaison Officer

[3] Points (d) and (f) relate to safety zones located in non-Scottish waters and therefore are not applicable to the Development.

3 Development Overview

This section provides a brief overview of the Development relevant to this Safety Zone Application and sets out the main roles and responsibilities in relation to Moray East and the key contractors. Further information is provided in the Development Specification and Layout Plan (DSLP).

3.1 Development Overview and Layout

The Development shall consist of the following main components:

- A total generating capacity of approximately 950 MW, however the total generation capacities will be constrained by the transmission entry capacity of 900 MW (further details provided within the DSLP);
- Up to 100 WTGs of no greater than 10 MW each;
- Jacket substructures each installed on three pile foundations driven into the seabed;
- Three Alternating Current (AC) OSPs to collect the generated electricity and transform the electricity for transmission to shore;
- A network of inter-array, buried or (if burying is not possible) mechanically protected, subsea cable circuits to connect strings of turbines together and to connect the turbines to the OSPs;
- Two inter-connector cable circuits that link the OSPs to one another;
- Three buried or (if burying is not possible) mechanically protected, subsea export cable circuits, to transmit the electricity from the OSPs to the landfall at Inverboyndie Bay and connecting to the onshore buried export cable circuits for transmission to the onshore substation and connection to the national electricity transmission system; and
- Minor ancillary works such as the deployment of met buoys and permanent navigational marks.

The location of the Development in the Moray Firth is shown in Figure 3.1.

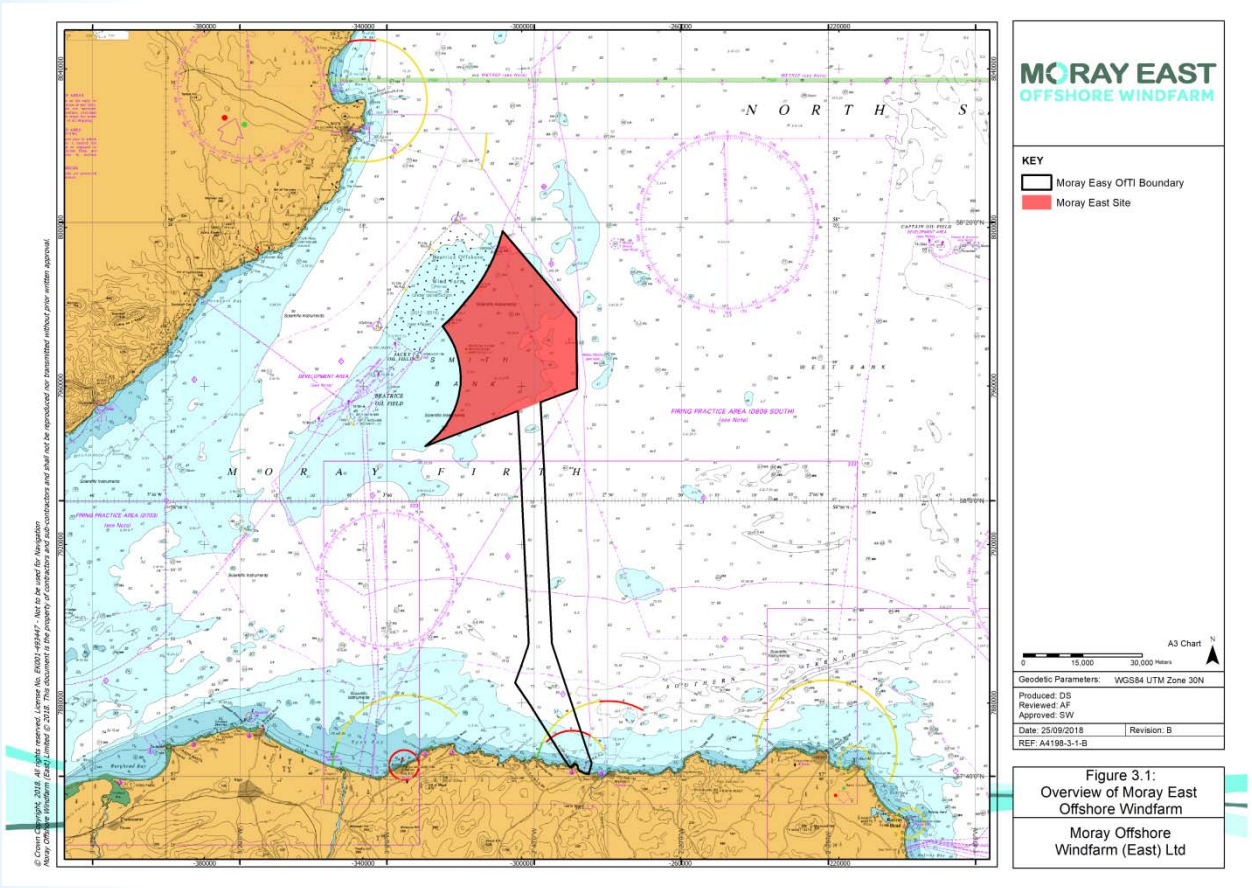

Figure 3.1: Overview of the Development

The final layout of WTGs and OSPs, subject to confirmation through final project design and engineering work, is presented in Figure 3.2. As indicated in Figure 3.2, this includes up to seven spare locations which would only be utilised in circumstances such as where there are ground conditions with a high risk of pile refusal including where these are encountered during the foundation installation operations at one or more of the WTG or OSP locations that cannot be overcome by micro-siting. Other project documentation will be updated to reflect these additional locations if required. The standard spacing between WTGs in the north to south axis is 1,128 m and in the east to west axis is 1,547 m. However there are a small number of cases where the north to south axis spacing shall differ from this, with an overall minimum spacing of 1,120 m.

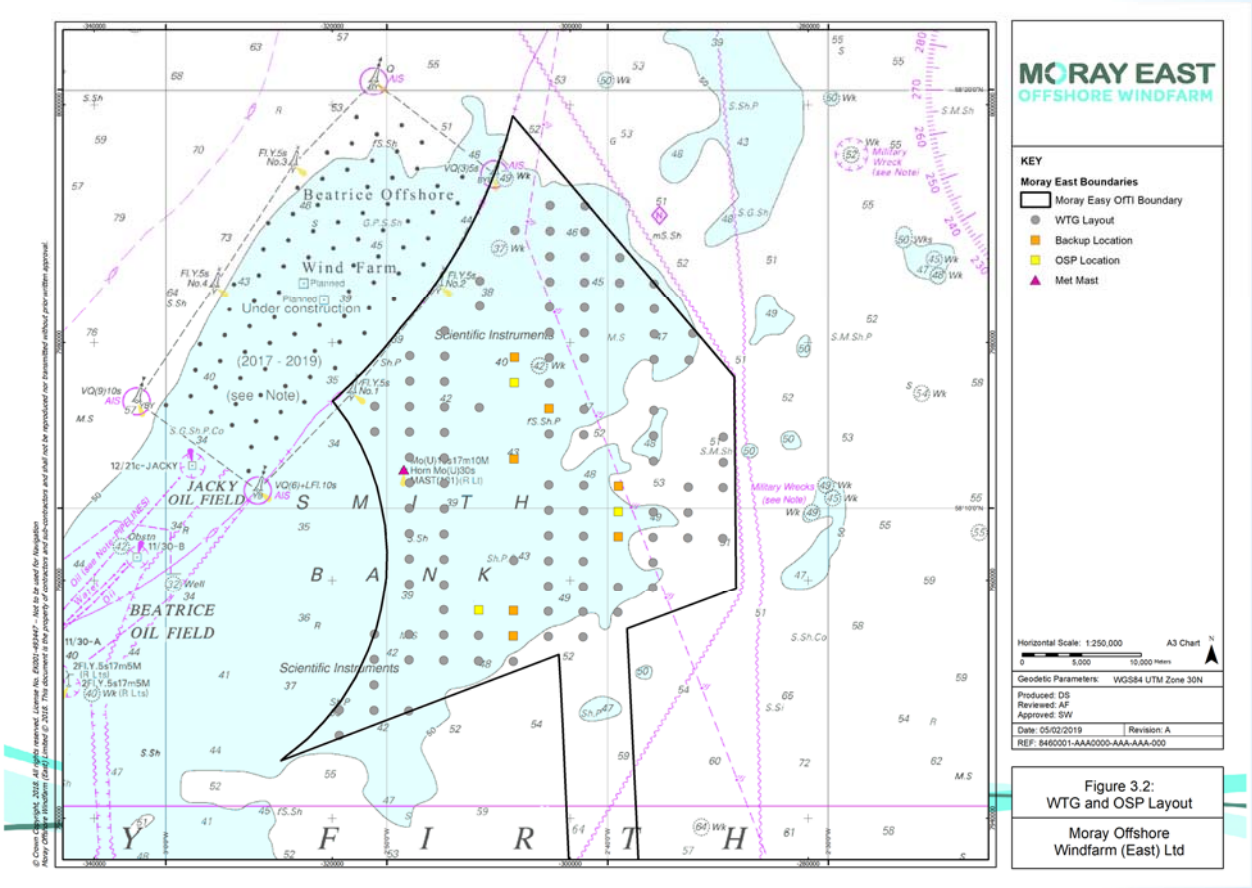

Figure 3.2: WTG and OSP Layout

3.2 Development Schedule

Offshore construction activities are scheduled to commence in May 2019 with piling at the Moray East site and horizontal directional drilling (HDD) at the landfall location (offshore "punch-out"). The Development is expected to be fully commissioned in February 2022. The current construction programme is presented in Figure 3.3. It is noted that the construction programme is valid as of February 2019 and will require approval through the revision of the CoP & CMS document. The construction programme may be subject to change due to a number of factors such as weather delays.

Item	Task	2018												2019												2020												2021												2022											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Project Milestones	FC												■																												■																					
	First Power																																								■																					
	Full Generation																																																															
OECs	Cable Lay & Burial																																																												
	HDD Works (Offshore)																■	■	■	■																																											
OSP (Topside)	Fabrication												■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																							
	Installation																																■	■	■	■																							
	Commissioning																																■	■	■	■	■																						
Piles (WTGs & OSPs)	Fabrication														■	■	■	■	■	■	■	■	■	■																																							
	Installation															■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																							
Jackets (WTGs & OSPs)	Fabrication																■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																							
	Installation																																■	■	■	■	■																							
IACs	Installation - campaign 1																																				■	■																							
	Installation - campaign 2																																						■	■																					
WTG	Installation																																									■	■	■	■	■	■	■	■	■	■	■	■										
	WTG Commissioning, Energisation & Take Over																																								■	■	■	■	■	■	■	■	■	■	■	■										

Figure 3.3: Indicative Construction Programme

4 Wider Context

The Safety Case supporting this Safety Zone Application represents one of a number of documents relevant to navigational safety for the Development. Other relevant documentation includes the following:

- Construction Programme (CoP) and Construction Method Statement (CMS) document;
- Development Specification and Layout Plan (DSLP);
- Emergency Response Cooperation Plan (ERCoP);
- Emergency Response Plan (ERP);
- Lighting and Marking Plan (LMP); and
- Vessel Management Plan (VMP) and Navigational Safety Plan (NSP) document.

5 Project Components

5.1 Foundations

The foundations for the WTGs shall comprise three steel pin piles with a three-legged tubular steel lattice jacket substructure. The maximum diameter of each pile shall be 2.5 m with a maximum pile length of 60 m.

Figure 5.1 presents an illustration of the WTG support structures.

5.2 Wind Turbine Generators

5.2.1 Wind Turbine Generator Properties

The Development shall consist of 100 WTGs, each with a generating capacity of 9.5 MW. Table 5.1 summarises the key properties of the WTG foundations.

Table 5.1: WTG Properties

Manufacturer	MHI Vestas
Number of WTGs	100
Generating capacity (per WTG)	9.525 MW
Rotor diameter	164 m
Number of blades	3
Maximum blade width	5.4 m
Hub height above Lowest Astronomical Tide (LAT)	113 to 117 m
Tip height above LAT	195 to 199 m
Interface height (foundation to transition piece) above LAT	23.4 to 26.9 m
Clearance blade tip to sea surface above LAT	31 to 35 m

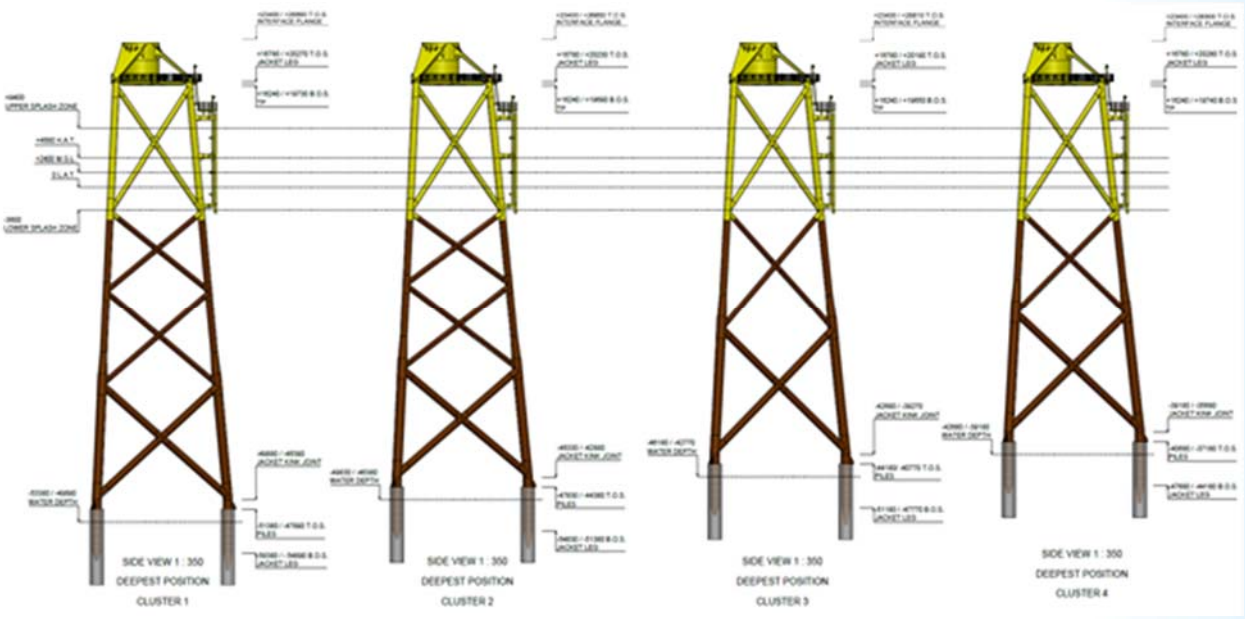

Figure 5.1: Illustration of WTG Support Structures

All structures within the array shall be equipped with a Supervisory Control and Data Acquisition (SCADA) system which shall allow remote supervision of the behaviour and control of all WTGs and the Moray East site as a whole.

5.2.2 Scour Protection

The current support structure design means that no scour protection will be required around most foundation structures, thereby reducing impacts on seabed habitats as a result of the placement of scour protection material. It is, however anticipated that a minority of the WTG foundations (up to 10 WTGs) located in areas of soft soils will require scour protection. In addition, foundations for the OSPs will require scour protection due to the number of cables terminating into these jackets.

Where required, the scour protection system will consist of materials deposited on the seabed either prior to or post pile installation in the form of a filter layer and surface rock placement.

5.3 Offshore Substation Platforms

The Development shall include three OSPs, each supported by the same tubular jacket substructure and foundation piles as the WTGs. Table 5.2 summarises the key dimensions of the OSPs.

Table 5.2: Key Dimensions of the OSPs

OSP topside dimensions (length×width×height)	33×30.7×26.9 m
Height of OSP jacket above LAT	20.4 m
Height of topside above LAT	35 m

5.4 Cabling

5.4.1 Export Cables

Three 220 Kilovolt (kV) standard High Voltage Alternating Current (HVAC) subsea export cable circuits shall run between the OSPs and the landfall location at Inverboyndie Bay on the Aberdeenshire coast, with total length approximately 95.4 nm. The export cables shall be buried within the sea sediments along their

length wherever possible. In locations where this is not possible, the cables will be mechanically protected.

5.4.2 Inter-Array Cables

Fifteen strings of 66 kV inter-array cables with total length approximately 84.2 nm (not accounting for micro-siting) shall be arranged in strings across the Moray East site, each likely to connect four to eight WTGs. The length of individual inter-array cables shall vary between approximately 0.6 and 2.1 nm.

5.4.3 Inter-connector Cables

Two 66 kV inter-connector cables shall link the OSPs to one another, with total length approximately 10 nm.

6 Construction Overview

Crew transfers (including use of a Service Operations Vessel (SOV)) during the construction phase shall take place from the construction port (which has yet to be identified).

The following subsections briefly outline the methodology for construction of each offshore component of the Development.

6.1 Foundations

Foundations may be delivered to ports within the Moray Firth or the East Coast of Scotland. Foundations shall be stored in an onshore laydown area before loadout for installation.

There are two types of vessel under consideration for installing the foundations; a self-propelled JUP is likely to install the foundations, which would result in a Platform Supply Vessel (PSV) undertaking the transportation of foundations to the Moray East site. Figure 6.1 presents an image of a typical JUP. Otherwise, if an HLV is used, then a barge shall be required for transportation.

Piles shall be lifted from the supply vessels horizontally and placed onto the installation vessel deck using the installation vessel crane. Installation of the piles shall be via driving or dive-drill-drive.

Figure 6.1: Image of a Typical JUP

6.2 Wind Turbine Generators and Offshore Substation Platforms

WTG components shall be delivered to a north east port from other construction bases in the UK and mainland Europe, where they shall be stored in an onshore laydown area for pre-assembly prior to loadout for installation.

A JUP shall be loaded with four complete turbines for each trip to the Moray East site. Once jacked down at the WTG location a walk to work gangway shall be put in place to allow access to the foundation. The WTG tower shall be installed first at each location followed by the nacelle and blades.

The OSP topsides consist of two decks and a winch pad which shall be assembled as a single unit prior to being loaded onto a barge and transported to the Moray East site. An HLV shall lift the topside and secured it onto the jacket substructure.

6.3 Cabling

6.3.1 Inter-array and Inter-connector cables

Prior to the installation of inter-array and inter-connector cables an installation support vessel shall mobilise at the Moray East site. Activities undertaken by this vessel shall include foundation inspection and pull-in equipment set-up, installation / checking of messenger lines located in the cable pull-in J-tubes, removal of the subsea and topside J-tube exit covers and a pre-construction survey of each cable route using a Work Class Remotely Operated Vehicle (WROV).

It is anticipated that inter-array and inter-connector cables shall be transported directly to the Moray East site from the manufacturing facility by a Cable Lay Vessel (CLV).

The CLV shall install the inter-array and inter-connector cables string by string with the installation support vessel preparing each structure for cable installation. The normal cable lay speed is anticipated to be between 400 and 600 metres per hour (m/hr).

Once installed the inter-array and inter-connector cables shall primarily be protected by burial. A Dynamic Positioning (DP) 2 class trenching support vessel shall undertake this activity using trenching tools and a survey Remotely Operated Vehicle (ROV). Where trenching of the cable is not practical the installation of rock placement is required. This shall be undertaken by a DP fallpipe vessel with the operation monitored by the fallpipe ROV.

6.3.2 Export Cables

The cable layer will transport the export cables to the Moray East site.

There are a number of offshore processes which may need to be undertaken in the installation of the export cables including:

- Pre-lay Grapnel Run (PLGR);
- Pre-lay boulder clearance;
- Cable collection;
- Cable installation;
- Cable free-lay and second end pull-in;
- Cable Burial; and
- Post installation survey.

The PLGR shall be undertaken in order to reduce the risk of a cable being laid on debris and shall be performed by a standard anchor handling vessel. Such a vessel shall then undertake boulder clearance work using a towed plough unit, with an ROV available to support the operations particularly during launch and recovery.

Having delivered the export cables, the chosen cable laying vessel is also anticipated to undertake the installation. Prior to its arrival, the Horizontal Directional Drilling (HDD) ducts at the approach to the landfall point shall be inspected and cleaned utilising divers and a small multicat or jack-up to assist. Following this, the installation vessel shall deploy the export cable into the duct and commence the process of laying the export cable with the assistance of the WROV.

Following the completing of cable laying ROVs shall be deployed from DP2 vessels to trench the export cables. Finally a post installation survey shall be undertaken using a free-flying ROV moving along the export cable route.

7 Operation and Maintenance Overview

Throughout the operation and maintenance phase it is anticipated that major maintenance shall be required in addition to the planned regular maintenance. Major maintenance requirements shall vary from year to year and therefore it is not currently possible to provide a comprehensive schedule for such activity. Examples of major maintenance activities are as follows, noting that this is not an exhaustive list:

- WTG gearbox replacement;
- WTG blade repair/replacement;
- WTG replacement; and
- OSP transformer replacement.

As noted in Section 1.2.2, during periods of major maintenance mandatory 500 m safety zones shall be established around any WTG and OSP structure where work is being undertaken on that structure. Major maintenance activities are likely to involve large vessels which may be RAM (e.g. jack-ups, floating barges and HLVs). Information regarding major maintenance including safety zones shall be promulgated via local Notice to Mariners and radio warnings, and shall be indicated by the presence of a RAM vessel as well as a guard vessel deployed at the Moray East site.

8 Service Operations Vessel

A Service Operations Vessel (SOV) will be utilised during the construction, and major maintenance activities. Indicative vessel details are provided in Table 8.1 (noting that these are subject to change given the SOV has yet to be finalised). The vessel will be equipped with a "walk to work" system, for crew and cargo transfer from the SOV to the wind farm structures.

Table 8.1: SOV Indicative Dimensions

Parameter	Value
Length	Up to 75m
Breadth	Up to 17.5m
Draught	Up to 5.5m
Gross Tonnage	3,500 – 4,000

Given the crew on board, and the "walk to work" system, 500 m safety zones are applied for around any structure where the SOV is stationed and displaying RAM status (during any project phase), as per Section 1.2.

It is noted that an SOV will only trigger a safety zone when the vessel is attached to or on station next to a structure. The safety zones are viewed as a required risk mitigation measure due to the vulnerable nature of the SOVs when they are in this operational condition including the transfer of personnel. There will be a maximum of one SOV working within Moray East site during the operation and maintenance phase at any one time.

9 Lighting and Marking

This section outlines the lighting and marking to be implemented at the Moray East site during the construction and operation and maintenance phases. Further details can be found in the LMP.

9.1 Construction Phase Marking

Navigational marking for the construction phase has been directed by the Northern Lighthouse Board (NLB) to alert mariners of the navigational safety hazards associated with the construction activities. The cardinal marks do not require mariners to avoid the area but do require them to consider the presence of hazardous activities within their passage. The International Convention for the Safety of Life at Sea (SOLAS) Chapter V as implemented by the Merchant Shipping (Safety of Navigation) Regulation 2002 requires all vessels on all voyages (irrespective of their activity) to have a passage plan in place. This passage plan must anticipate all known navigational hazards.

All required construction phase buoyage shall be established prior to the commencement of construction works (in agreement with NLB) with required notification submitted. Construction phase buoyage shall consist of three cardinal marks and six special marks, as shown in Figure 9.1. Following this, Table 9.1 summarises the buoyage to be installed throughout the construction phase.

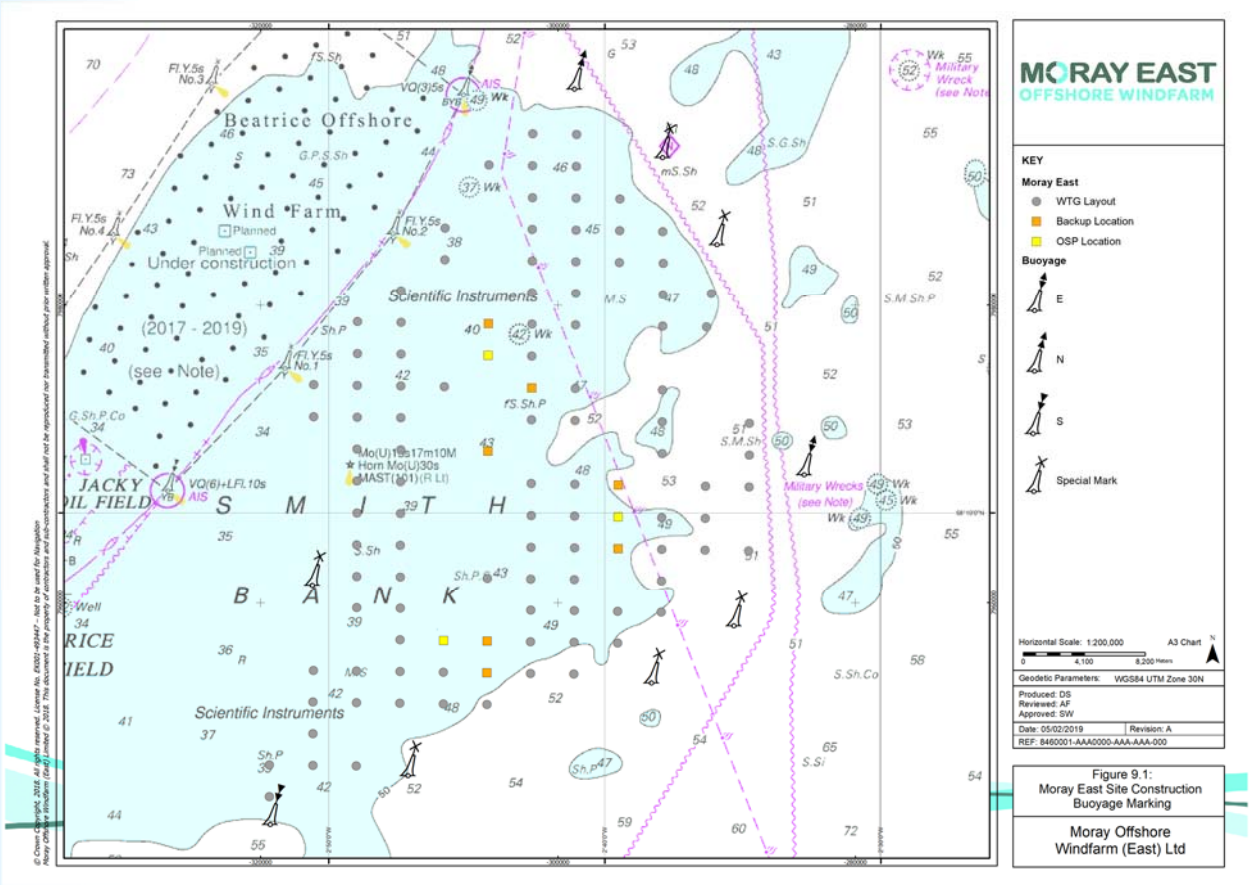

Figure 9.1: Moray East site Construction Buoyage Marking

Table 9.1: Construction Phase Buoyage Summary (Universal Transverse Mercator (UTM) Zone 30N World Geodetic System (WGS) 84

Buoy	Latitude	Longitude	Specification
North Cardinal	58° 18’ 6.57” N	002° 41’ 4.80” W	• With a focal plane of at least 3 m and range of 5 nm; • Minimum of 3 m in diameter at waterline; • Pillar shaped with a north cardinal shaped top mark, exhibiting a Quick (Q) White (W) light character; • Category 1 Availability - 99.8% (IALA 2011); • Radar Reflector; and • AIS Aids to Navigation (AtoN) transmitter (Category 3 Availability - 97.0%).
East Cardinal	58° 10’ 44.10” N	002° 32’ 45.85” W	• With a focal plane of at least 3 m and range of 5 nm; • Minimum of 3 m in diameter at waterline; • Pillar shaped with an east cardinal shaped top mark, exhibiting a Very (V) Q (3) 5 second (s) W light character; • Category 1 Availability - 99.8% (IALA 2011); • Radar Reflector; and • AIS AtoN transmitter (Category 3 Availability - 97.0%).
South Cardinal	58° 4’ 1.11” N	002° 52’ 6.68 W	• With a focal plane of at least 3 m and range of 5 nm; • Minimum of 3 m in diameter at waterline; • Pillar shaped with a south cardinal shaped top mark, exhibiting a V Q (6) + Long (L) Fl 10s W light character; • Category 1 Availability - 99.8% (IALA 2011); • Radar Reflector; and • AIS AtoN transmitter (Category 3 Availability - 97.0%).
Special Mark (×6)	58° 16’ 48.28” N	002° 37’ 55.40” W	• With a focal plane of at least 3 m and range of 5 nm; • Minimum of 3 m in diameter at waterline; • Pillar shaped with a yellow ‘x’ shaped top mark, exhibiting a Fl Yellow (Y) 5s light character; • Category 2 Availability – 99% (IALA 2011); and • Radar Reflector.
	58° 15’ 8.48” N	002° 35’ 57.28” W	
	58° 7’ 49.70” N	002° 35’ 20.63” W	
	58° 6’ 43.97” N	002° 38’ 19.84” W	
	58° 4’ 57.22” N	002° 47’ 9.35” W	
	58° 8’ 37.09” N	002° 50’ 37.07” W	

During the construction phase any substructure which is left partially constructed by the installation vessel for any significant time period shall be marked with a construction phase navigational light (Fl Y 2.5s) with 2 nm range visible through 360 degrees (°).

The construction phase buoyage shall be deployed at least four weeks prior to construction commencing and shall remain in place until all operational phase lighting and marking has been inspected and approved by the NLB.

9.2 Operation and Maintenance Phase Lighting and Marking

9.2.1 Marine Navigation

All WTGs which are designated as a Significant Peripheral Structure (SPS) or Intermediate Peripheral Structure (IPS) shall be marked with an appropriate navigational light. Sound (fog) signals shall also be installed on a number of the WTGs designated as SPSs. Table 9.2 summarises the navigational lighting and marking to be installed throughout the operation and maintenance phase.

Table 9.2: Operation and Maintenance Phase Lighting and Marking Summary

Structure Class	WTG	Specification
SPS	ME-A01 ME-F04 ME-H05 ME-L09 ME-L13 ME-K17 ME-H22 ME-B13 ME-C09 ME-B05	• Located on a corner or other significant point; • Each SPS shall have 360° visibility, with flashing IALA special mark characteristics (Fl Y 5s) and with a range of not less than 5 nm; • IALA Category 1 (at least 99.0% availability); • All SPS lights shall be synchronised; and • Lights shall be located not less than 6 m and not more than 30 m above Highest Astronomical Tide (HAT).
IPS	ME-C02 ME-J07 ME-L11 ME-J19 ME-E19 ME-C16 ME-C07 ST-A01 (Met Mast)	• Structures on the periphery of the layout other than SPS considered to require additional lighting; • Each IPS shall have 360° visibility with a flashing yellow light different to the SPS (Fl Y 2.5s) and with a range of not less than 2 nm; • IALA Category 2 (at least 99.0% availability); • All IPS lights shall be synchronised; and • Lights shall be located not less than 6 m and not more than 30 m above HAT.
Sound (fog) signals	ME-A01 ME-H05 ME-L09 ME-L13 ME-K17 ME-H22 ME-B13 ME-B05	• Foghorns on transition piece must face outward into open sea and sound signals must be unimpeded by the tower; • IALA Category 3 (at least 97% availability) over a rolling three year period; and • Each WTG fitted with a sound signal will also have a visibility meter. Sound signals will turn on when visibility is detected to be less than 2 nm.

All jacket foundations shall be painted traffic yellow (RAL 1023 Traffic Yellow) all around up to 18.9 m above HAT. The tower of each WTG shall be painted grey (RAL 7035 Light Grey). Each WTG and OSP shall be painted with black letters and numbers on a yellow background visible in all directions, as indicated in Figure 9.2 below (further details are provided within the LMP).

Figure 9.2: Example ID Marking

9.2.2 Aviation

All periphery structures shall be equipped with two aviation warning lights lit with a synchronised flashing red Morse Code “W” during normal operations. The intensity of these lights shall be 2000 Candela when the visibility is less than 5 km and 200 Candela when the visibility is greater than 5 km, with 360° coverage.

10 Marine Traffic Survey Data

The Moray East NRA, submitted in 2010, presented survey data collected via AIS and Radar over a 90 day period between 1st May and 31st July 2010. To assess the validity of the vessel traffic data in the NRA, a further 28 days of AIS data recorded between 4th and 31st Match 2018 has been analysed.

10.1 Survey Data Overview

The AIS tracks recorded during the NRA survey and Safety Zone Application survey are presented in Figure 10.1 and Figure 10.2 respectively and are colour-coded by vessel type.

It is noted that construction of the Beatrice Offshore Wind Farm commenced in March 2017 with the project anticipated to be fully commissioned in 2019. Given the temporary nature of the activities being undertaken by vessels associated with the Beatrice project and the fact that offshore construction of the Development is not scheduled to commence until 2019 (see Section 3.2), such vessels have been excluded from Figure 10.2 and the analysis which follows. It should be considered that there will be some traffic associated with the operation of the Beatrice Project; however such traffic would be expected to be limited when compared to the construction traffic.

It can be seen that in both survey periods the majority of traffic was in transit using the route to the east of the Moray East site. This route comprises mainly cargo vessels, fishing vessels and tankers. Vessels were recorded within the Moray East site during both surveys.

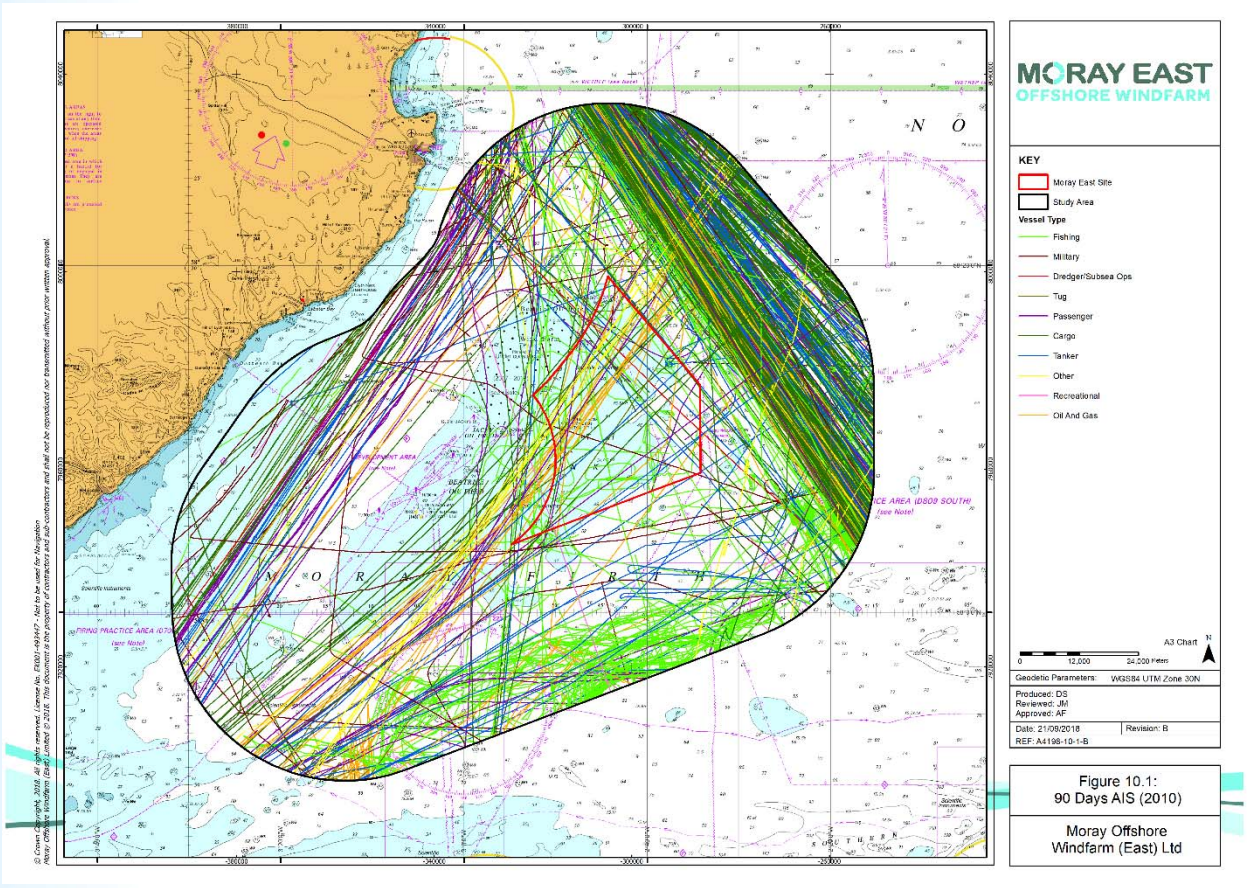

Figure 10.1: 90 Days AIS Data (2010)

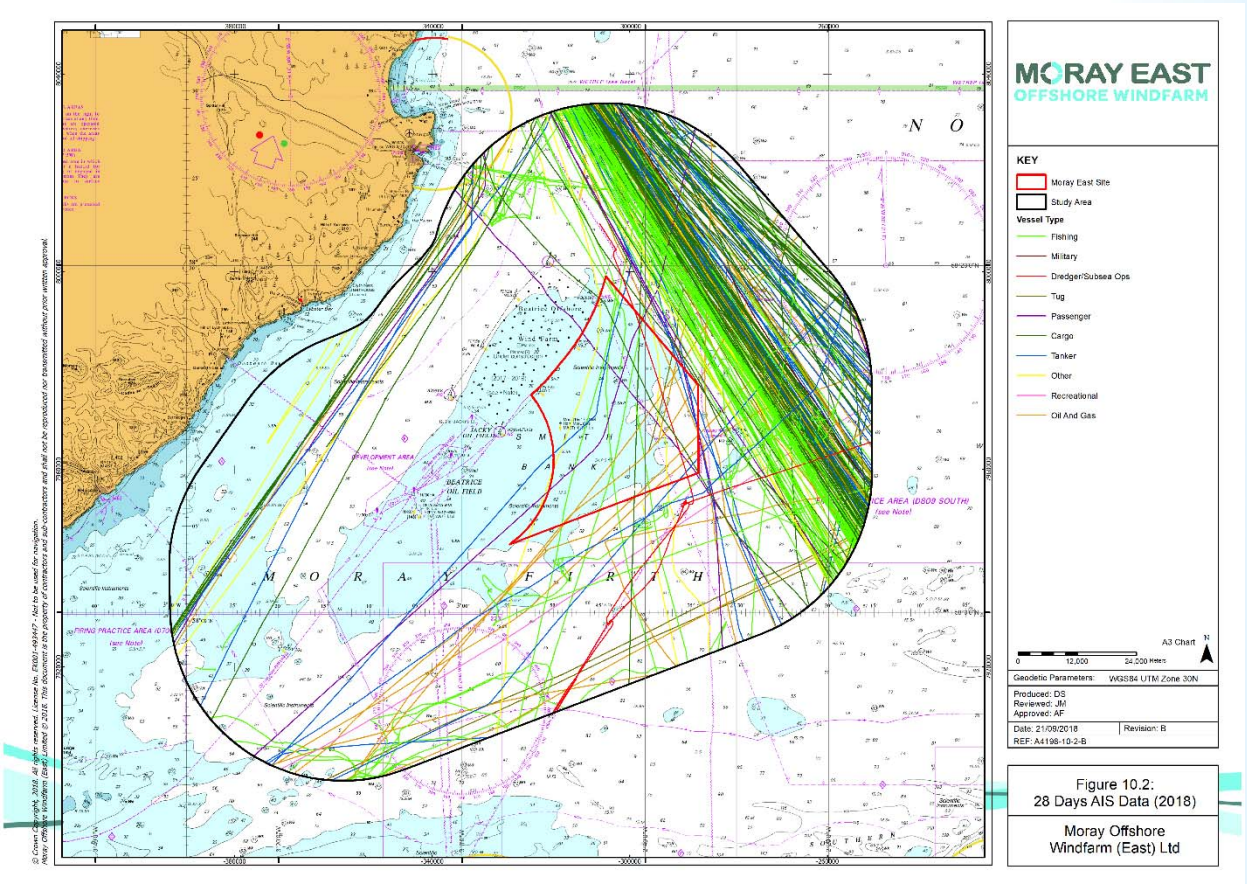

Figure 10.2: 28 Days AIS Data (2018)

10.2 Data Validation

This subsection compares the original NRA data from 2010 with the updated survey data recorded in 2018 for validation purposes. It is noted that the duration of the 2018 survey period is shorter than the period assessed as part of the NRA (90 and 28 days for 2010 and 2018, respectively). For consistency, the analysis of both surveys has been undertaken for vessels recorded within 10 nm of the development area; this is an area which contains both the Moray East and Moray West sites, as per the NRA traffic analysis. It is noted that 2018 represents the current scenario of the neighbouring project, Beatrice Offshore Wind Farm (OWF) under construction, with vessels associated with construction activities excluded as highlighted above in Section 10.1.

10.2.1 Vessel Count

The average number of unique vessels per day was computed for each of the survey periods. Note that the analysis is based upon AIS only (i.e. the Radar data from the 2010 survey has been excluded).

An average of approximately 11 unique vessels per day was recorded in both survey periods. Overall, the difference in the volume of traffic recorded within the study area during the 2010 and 2018 surveys was insignificant.

10.2.2 Vessel Type

The vessel type distributions recorded during the 2010 and 2018 surveys are compared in Figure 10.3.

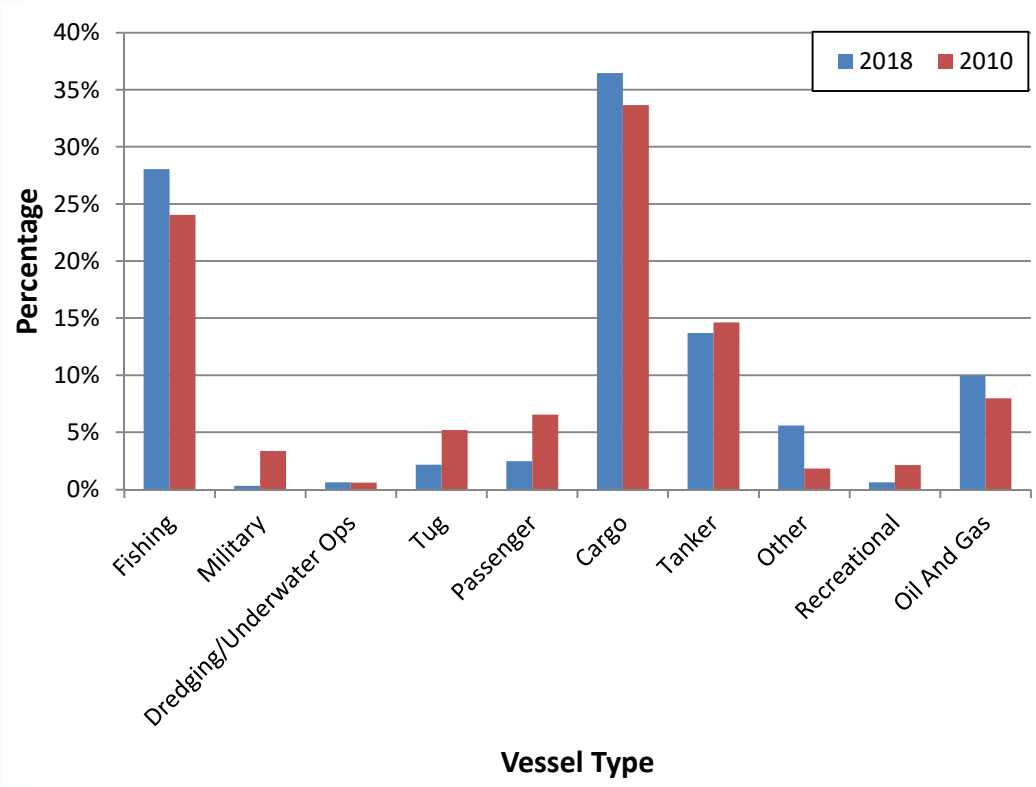

Figure 10.3: Vessel Type Distribution

Overall, there was good correlation between the two datasets, with both showing cargo vessels and fishing vessels to be the most frequent vessel types.

It is noted that a higher proportion of military vessels were recorded during the 2010 survey. These were fishery patrol vessels and have reduced in numbers due to the devolution of the monitoring of fishing in Scottish waters which is now the responsibility of Marine Scotland.

Recreational vessels and passenger vessels were also in greater numbers during the 2010 survey. This difference is likely due to seasonal variation given that the 2010 survey was undertaken across a summer period, whereas the 2018 survey was undertaken in spring.

10.2.3 Intersecting Vessels

Figure 10.4 and Figure 10.5 present the AIS tracks recorded intersecting the Moray East site throughout each survey period, colour-coded by vessel type.

It can be seen that the main route in the 2010 survey was passing through the site in a south westerly direction towards the Inner Moray Firth; the number of vessels using this route in the 2018 survey was significantly reduced due to the construction works at the Beatrice OWF which the route passes through. The 2018 survey data indicates a route passing through the east of the Moray East site which may be due to adverse weather conditions or Masters' routeing preferences.

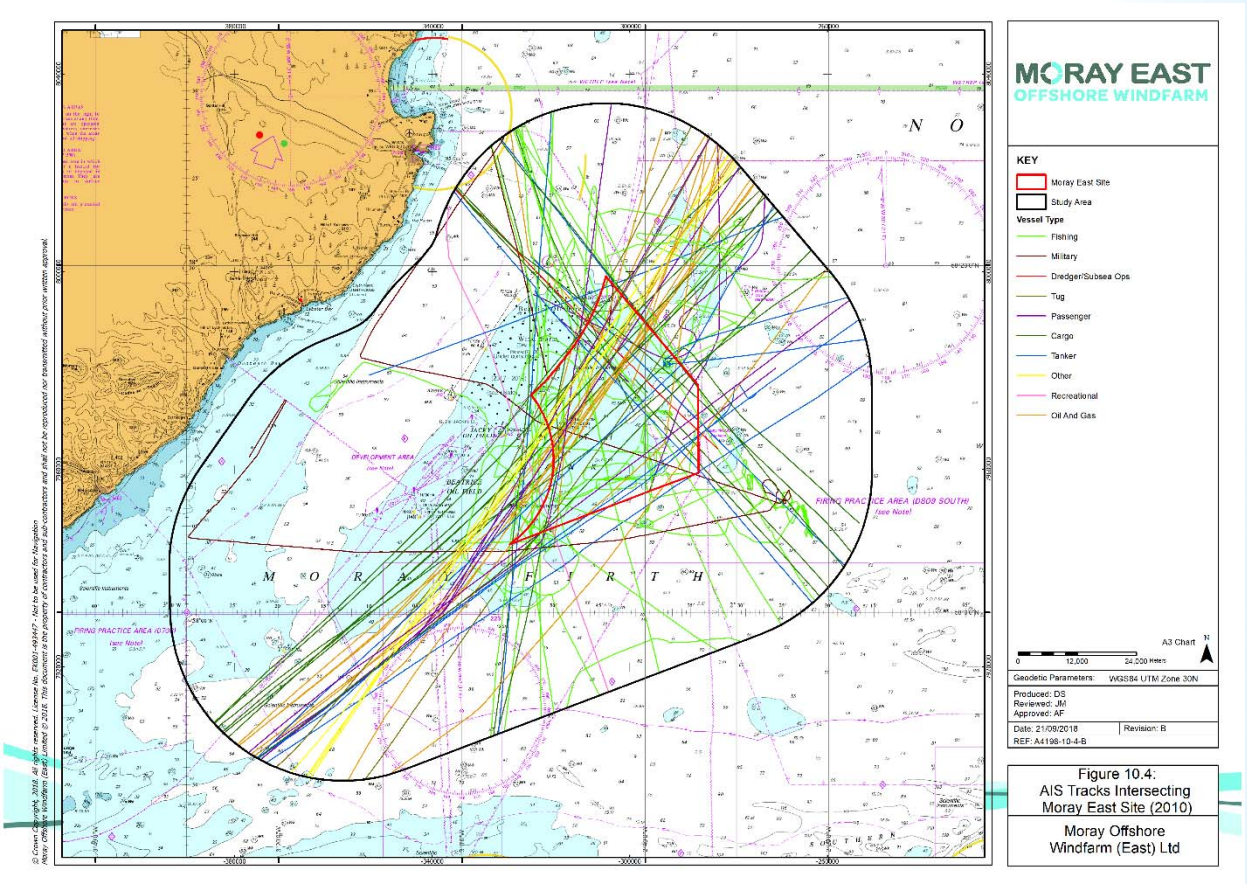

Figure 10.4: AIS Tracks Intersecting Moray East site (2010)

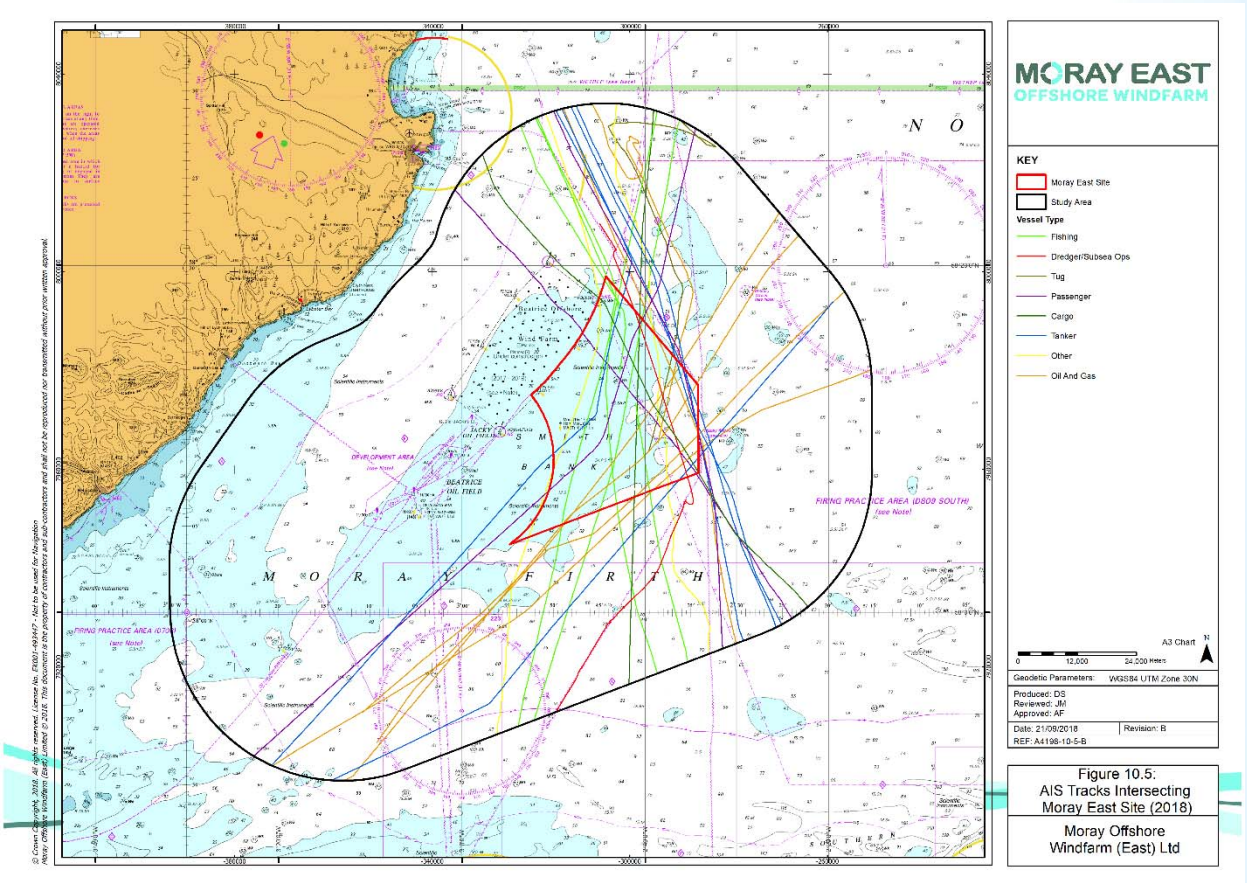

Figure 10.5: AIS Tracks Intersecting Moray East site (2018)

10.2.4 Cargo Vessels

Figure 10.6 and Figure 10.7 present the AIS tracks recorded from cargo vessels throughout the 2010 and 2018 survey periods, respectively.

Cargo vessels accounted for 34% and 36% of the total vessel traffic throughout the 2010 and 2018 survey periods, respectively. For the 2018 survey, an average of approximately four unique cargo vessels per day was recorded which correlates well with the 2010 survey when approximately four unique cargo vessels per day was also recorded.

It can be seen that in both surveys the majority of cargo vessels which passed through the study area did so to the east of the Moray East site. The 2010 survey also noted cargo vessels routeing to and from ports within the Inner Moray Firth and passing through the Moray East site. The construction works at the Beatrice OWF have resulted in this traffic reducing significantly, with only a small number of cargo vessels passing between the mainland and the Beatrice buoyed construction area. Some of the vessels noted in the 2010 survey period that passed through the Moray East site appear to pass to the north in the 2018 survey data.

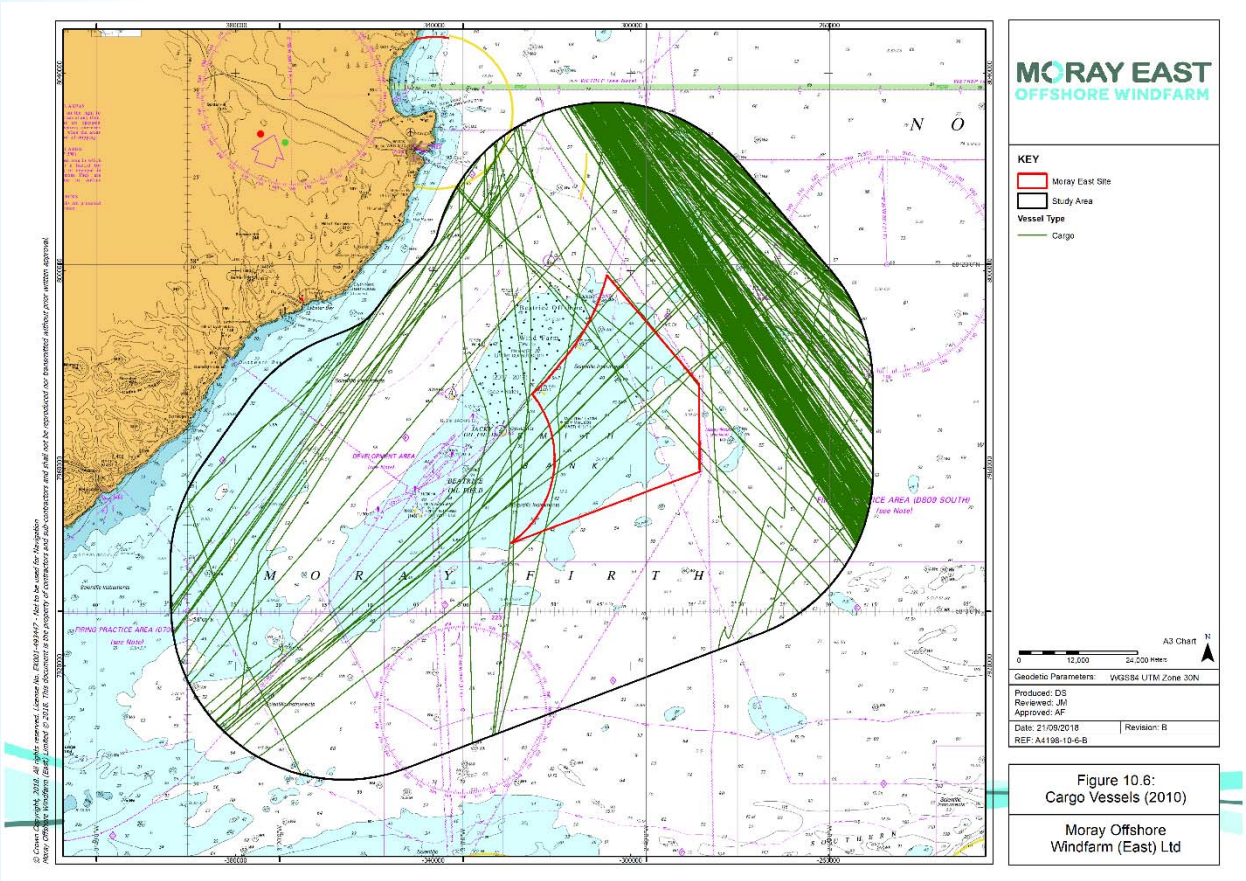

Figure 10.6: Cargo Vessels (2010)

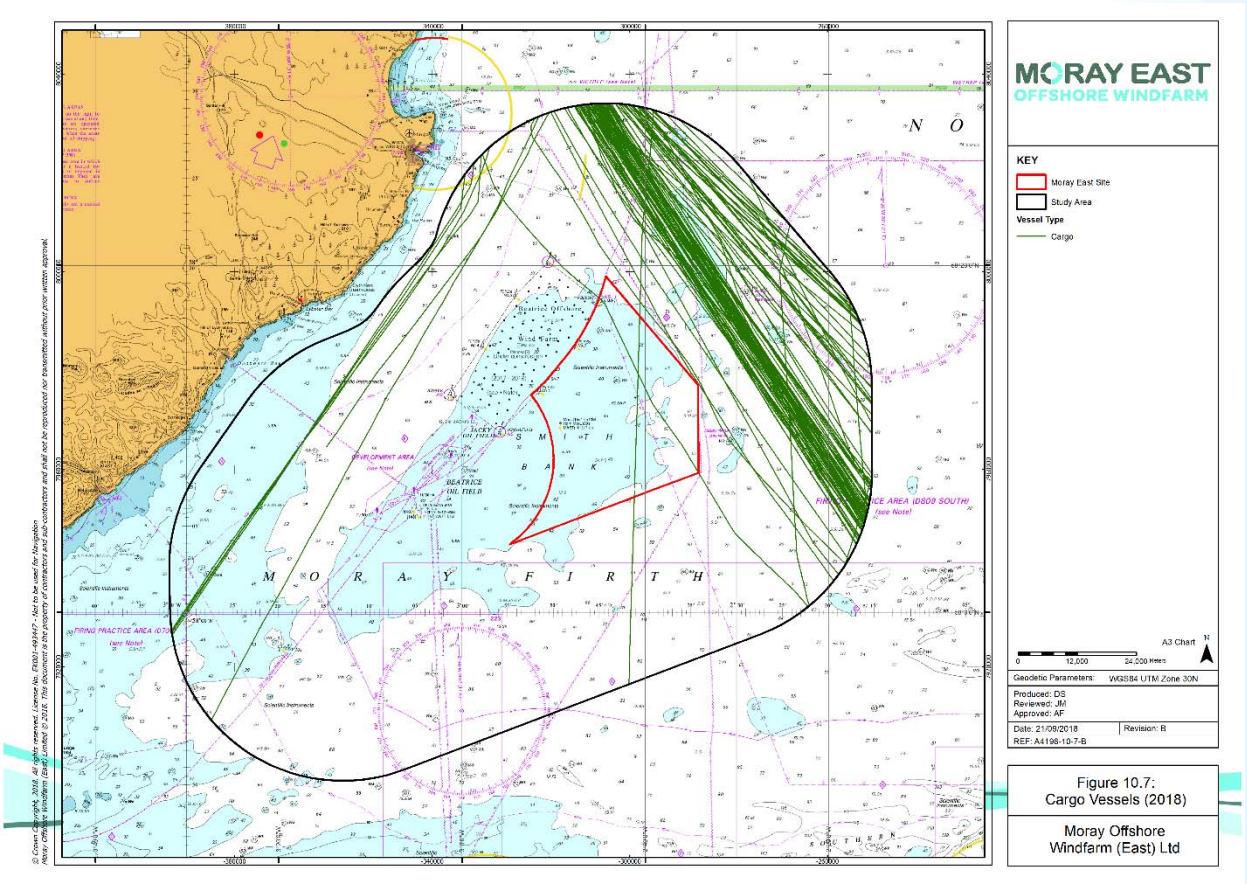

Figure 10.7: Cargo Vessels (2018)

10.2.5 Tankers

Figure 10.8 and Figure 10.9 present the AIS tracks recorded from tankers throughout each survey period.

Tankers accounted for 15% and 14% of the total vessel traffic throughout the 2010 and 2018 surveys, respectively. For the 2018 survey, an average of one to two unique tankers per day were recorded which correlates well with the 2010 survey when one to two unique tankers per day were also recorded.

The minor route to the south of the Moray East site which appears in the 2010 survey was absent from the 2018 survey. This may be attributed to the construction works at the Beatrice OWF which may have resulted in tankers undertaking an alternative passage. A minor route passing through the eastern extent of the Moray East site is noted in the 2018 survey; this may be attributed to adverse weather conditions or Masters' routeing preferences.

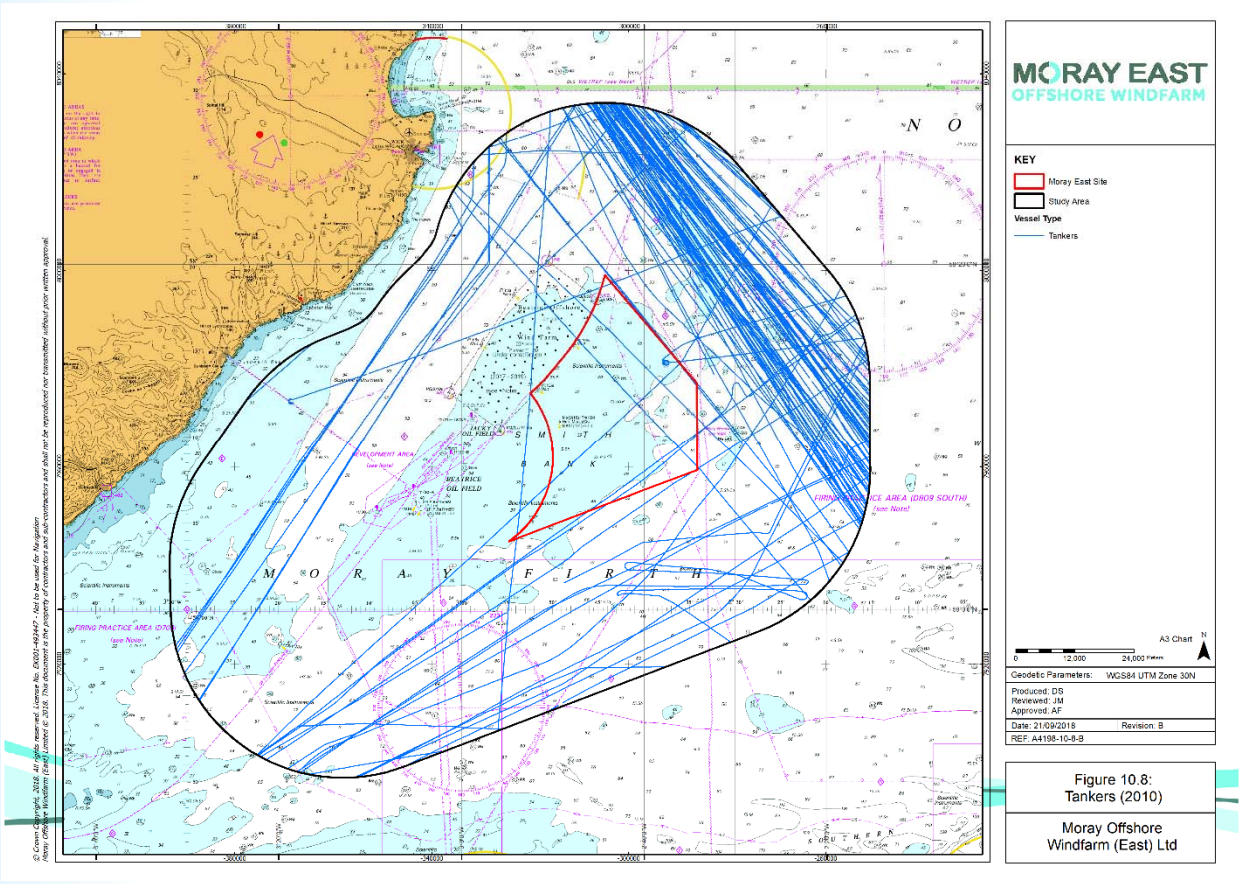

Figure 10.8: Tankers (2010)

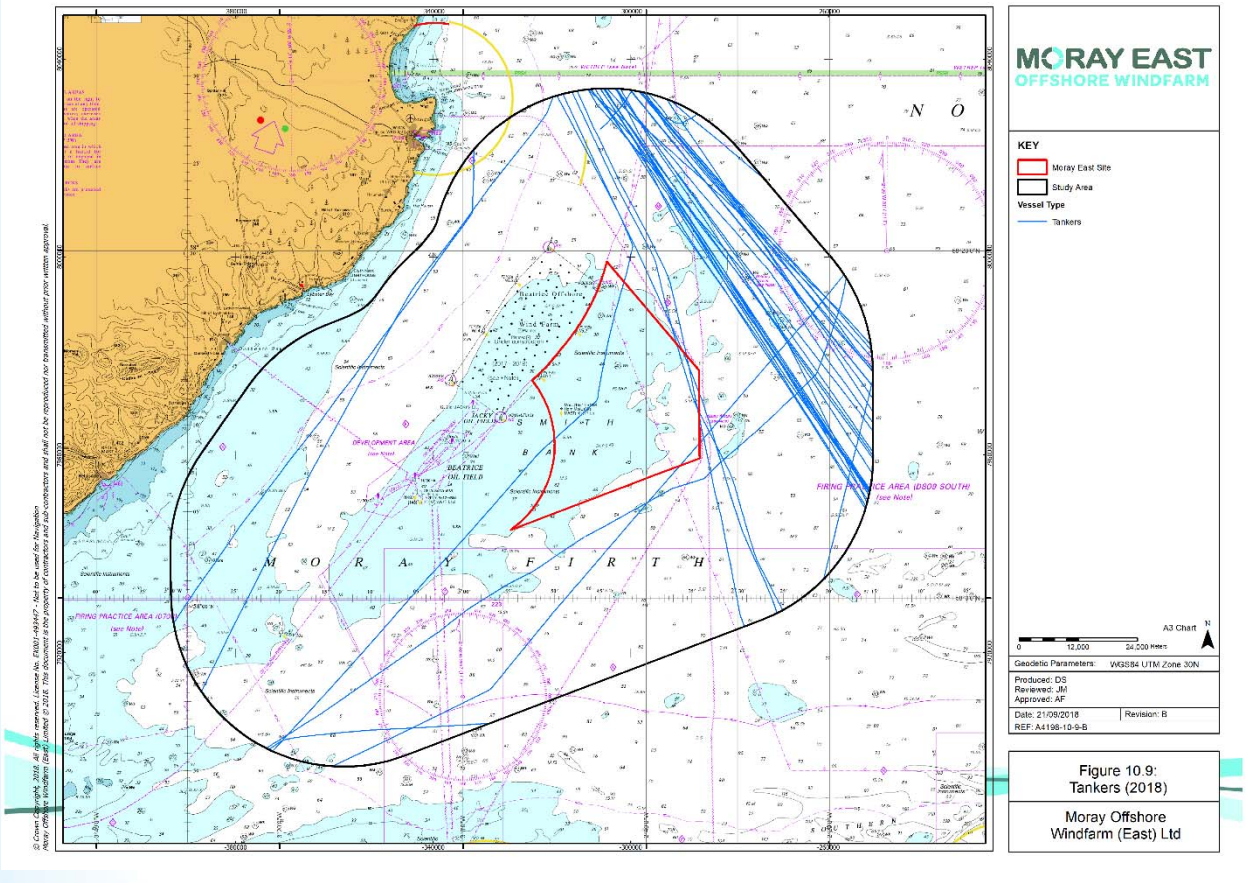

Figure 10.9: Tankers (2018)

10.2.6 Fishing Vessels

Figure 10.10 and Figure 10.11 present the AIS tracks recorded from fishing vessels throughout each survey period.

Fishing vessels accounted for 28% and 24% of the total vessel traffic throughout the 2010 and 2018 surveys, respectively. For the 2018 survey, an average of approximately three unique fishing vessels per day were recorded which correlates well with the 2010 survey when two to three unique fishing vessels per day were recorded.

A decrease in the number of vessels actively fishing within the study area was noted; seasonal variation is considered a large factor in this change, particularly given the similar volume of routeing fishing vessels passing east of the Moray East site. The presence of construction works at the Beatrice OWF may also have contributed to decrease.

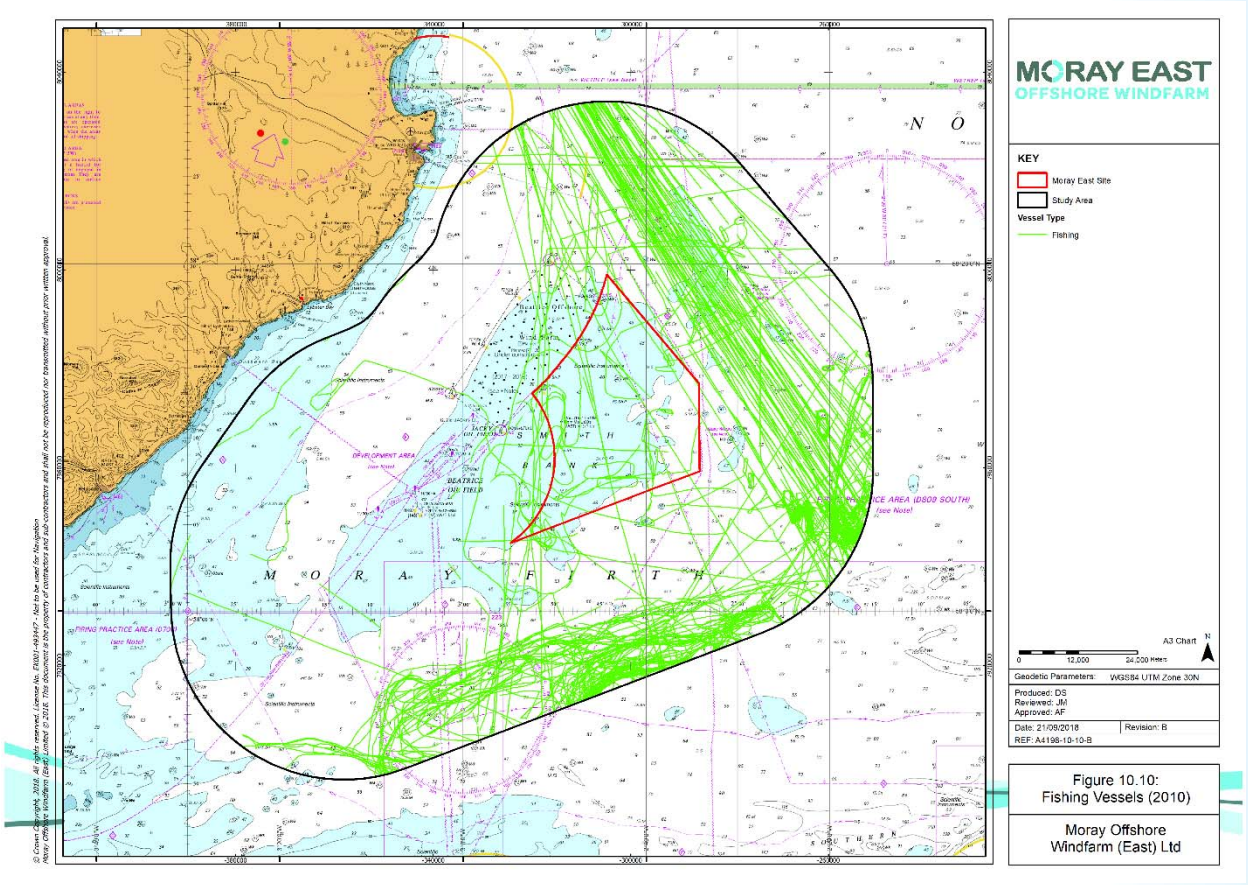

Figure 10.10: Fishing Vessels (2010)

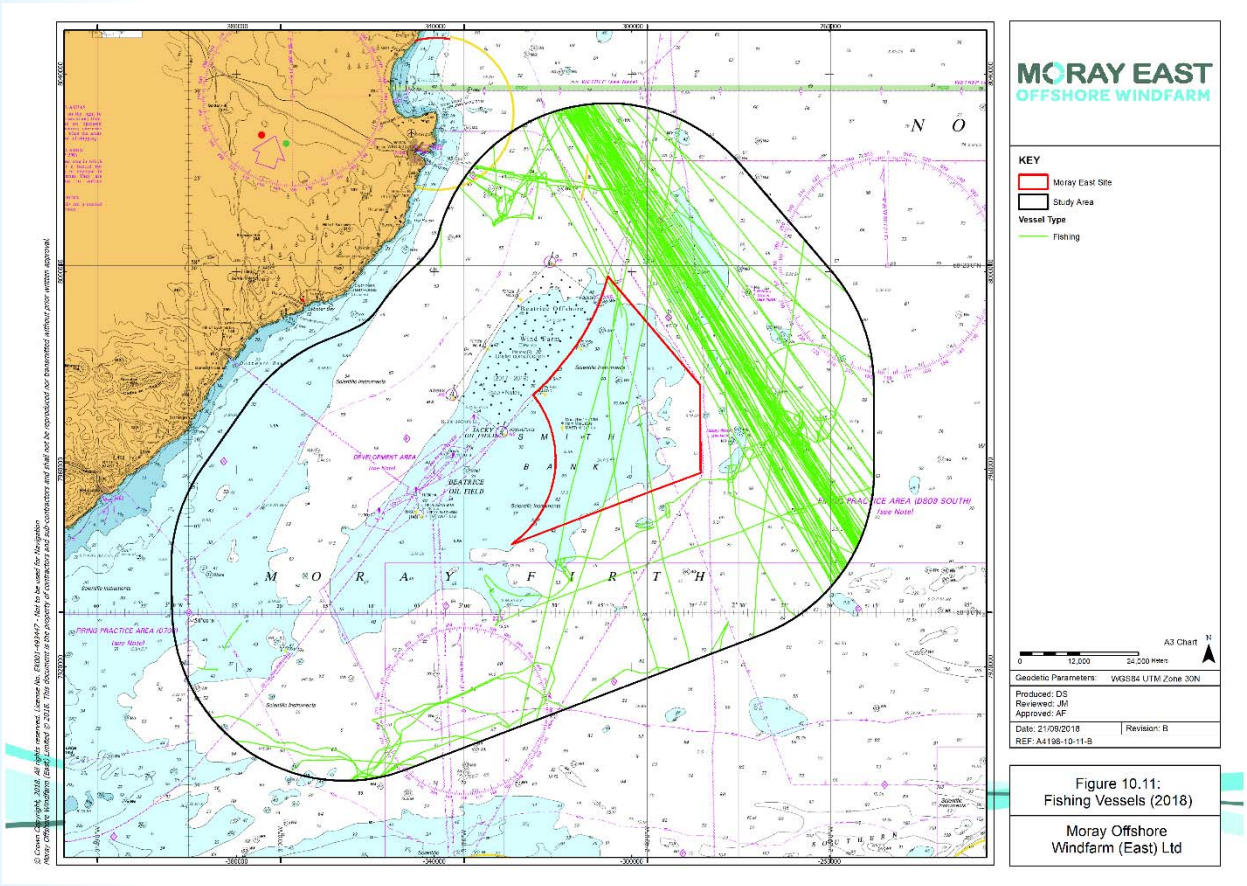

Figure 10.11: Fishing Vessels (2018)

10.2.7 Oil and Gas Support Vessels

Figure 10.12 and Figure 10.13 present the AIS tracks recorded from Oil and Gas support vessels throughout each survey period.

Oil and Gas support vessels accounted for 8% and 10% of the total vessel traffic throughout the 2010 and 2018 surveys, respectively. For the 2018 survey, an average of approximately one unique Oil and Gas support vessel per day was recorded which correlates well with the 2010 survey when approximately one unique Oil and Gas support vessel per day was also recorded.

During both surveys Oil and Gas support vessels passed within the Moray East site, although such traffic appears to pass further south in the 2018 survey at a greater distance from the ongoing construction works at the Beatrice OWF.

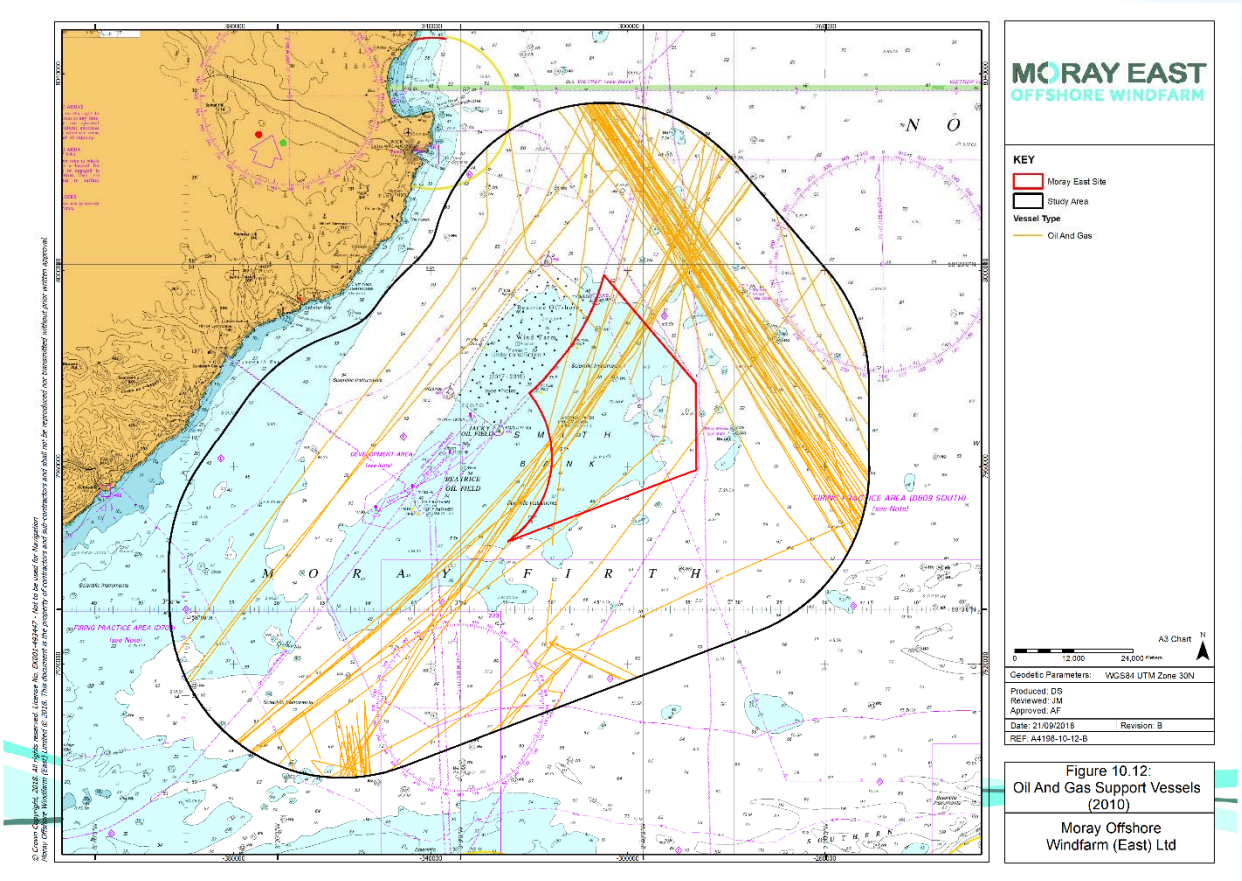

Figure 10.12: Oil and Gas Support Vessels (2010)

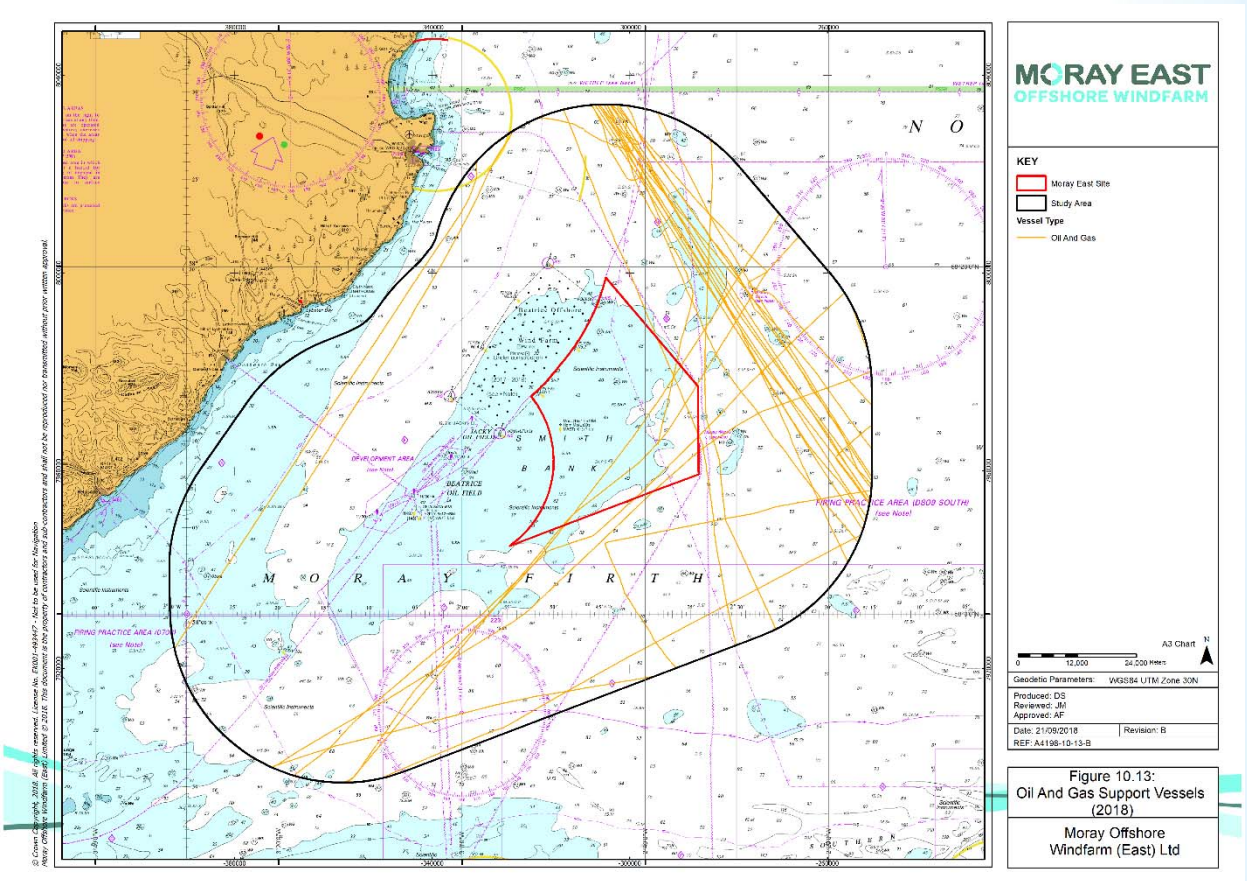

Figure 10.13: Oil and Gas Support Vessels (2018)

10.2.8 Recreational Vessels

A minimal level of recreational vessel activity was recorded within the study area during the 2018 survey whereas there were a small number of AIS tracks recorded in the 2010 survey; seasonal variation is considered the main factor in this change, particularly given that the carriage of AIS on recreational vessels has increased significantly between the two survey periods (which would naturally suggest an increase in recreational vessel activity).

It is noted that recreational vessel activity is likely to be under-represented throughout both surveys since there is no mandatory requirement for recreational vessels to carry AIS.

10.2.9 Anchored Vessels

For the purposes of this validation, a vessel was deemed to be at anchor if it had travelled at a speed of less than one knot for more than 30 minutes. Applying these criteria, no vessels were deemed to be at anchor during the 2018 survey. This may be attributed to the lack of slow moving traffic, as most vessels were in transit, and is in line with the findings of the 2010 survey where only one vessel was deemed to be at anchor throughout the survey period.

11 Risk Assessment Required for Safety Zones

This section considers the potential risks to shipping and navigation identified for the construction and operation and maintenance phases of the Development. This section forms the safety case-based element of the application and summarises potential risks that provide justification for the safety zones being sought.

11.1 Reduction in Collision Risk

Throughout the construction phase of the Development, a number of construction vessels shall be within the buoyed construction area carrying out the installation of foundations, WTGs and inter-array / inter-connector cables. This shall involve the utilisation of a large variety of vessels including barges, tugs, jack-ups, HLVs, SOV and CLVs. The multi-activity nature of the construction phase may result in large numbers of these vessels being on-site simultaneously, including vessels which are RAM. During any particular construction activity at a particular location the likelihood is that only one large vessel shall be present, with support from a number of smaller vessels however as a worst case up to three large vessels (per structure location) is assumed

In the case of the operation and maintenance phase, it is anticipated that there shall only be multiple vessels on-site simultaneously during periods of major maintenance. This is likely to involve only one large vessel (potentially an SOV) supported by a number of smaller vessels. The total number of vessel movements associated with major maintenance activities is anticipated to be significantly lower than that of construction activities.

As noted in Section 10.2.3, there is a vessel route which passes through the east of the Moray East site. Although any vessel on this route may be at risk of colliding with vessels associated with the works at the Moray East site it is anticipated that mariners shall alter their passage plans to pass well clear of activities being undertaken, particularly given that the vessels on this route should already have good awareness of the ongoing construction activity at the nearby Beatrice OWF.

There is also a main route which passes north east of the site. Cargo vessels, tankers and fishing vessels make up the majority of traffic on this route. There is considered to be a low risk of collision between vessels utilising this route and vessels associated with the works at the Moray East site given the distance at which the majority of routeing vessels pass the Moray East site.

The presence of construction and major maintenance vessels as well as partially completed or pre-commissioned wind farm structures should encourage mariners to pass at a safe distance from the activities; however the use of mandatory 500 m safety zones around major maintenance (or 50 m for pre commissioned or partially completed structures) should provide an additional level of protection against a collision incident by ensuring that the sea area where construction is being undertaken is clear. Should a vessel approach or infringe a safety zone they shall be alerted using the standard procedures outlined in Section 13.

Other mitigation measures which shall be implemented to reduce the collision risk during the construction and operation and maintenance phases include:

- Use of buoys to mark the Development during the construction phase;
- Charting of the Moray East site during all phases;
- Provision of a guard vessel(s) and a Marine Coordination Centre (MCC) to monitor activities on Very High Frequency (VHF) and AIS; and
- Promulgation of information (e.g. Notice to Mariners, Kingfisher, port liaison, etc.)

11.2 Reduction in Allision Risk

Throughout the construction phase of the Development, any partially completed or pre commissioned wind farm structures poses an allision risk to passing traffic, particularly earlier in the construction phase when mariners may be less aware of the Development and the associated construction activities. The use of a guard vessel(s) may discourage vessels from approaching the Moray East site; however the use of mandatory 500 m safety zones around partially completed structures (or 50 m for pre commissioned structures) should aid with encouraging mariners to increase their passing distance from the Development.

Moreover, the need to promulgate details of the safety zones to stakeholders in addition to more general information regarding the construction works should further increase awareness of the Development and therefore reduce the overall allision risk.

Again, should a vessel approach or infringe a safety zone they shall be alerted using the standard procedures outlined in Section 13.

Other mitigation measures which shall be implemented to reduce the allision risk during construction and operation and maintenance phases include those listed in Section 11.1 and the lighting of partially completed structures with a construction phase navigational light (Fl Y 2.5s with 2 nm range visible through 360°).

It is noted that the piles put in place for the foundations of the WTGs and OSPs will not pierce the water surface however could still present a navigational risk to vessels. While it is not deemed necessary or possible for safety zones to be put in place for the piles, the following mitigations are proposed to reduce navigational risk.

- The use of guard vessel(s) (when deemed necessary by risk assessment) will enable vessels approaching the Moray East site to be informed of the risk, while the presence of the buoyed construction area will highlight the presence of the site and that it is under construction to vessels passage planning through the area.
- Details of piling operations will be issued through regular Notice to Mariners, including Kingfisher bulletins. These will include charts and coordinates detailing the pile locations and again will assist in effective passage planning.
- Moray East will have regular contact with fishing stakeholders through Commercial Fisheries Working Group meetings, the company Fisheries Liaison Officer (FLO) and through a FLO on board of the vessel carrying out the piling operation.

It is noted that pre-installation of the piles may reduce water depth and therefore impact on under keel clearance. Additional mitigation may need to be utilised should navigable depths be reduced sufficiently to impact upon navigation (e.g., buoyage, guard vessels). Any such measures would be agreed with the MCA and NLB once details of the activity are known.

11.3 Reduction in Risk of Interaction with Anchor Spread

During the construction phase, construction vessels may be anchored to the seabed by a spread of anchors which on occasion may extend outwards of 1,000 m from the vessel. Furthermore during the operation and maintenance phase, maintenance vessels may anchor to the seabed whilst undertaking major maintenance. The presence of subsea anchors and anchor chains gives rise to the risk of a passing vessel interacting with them, which could have severe consequences both for passing traffic and construction and maintenance vessels.

The implementation of mandatory 500 m safety zones would ensure that passing traffic stays clear of locations where the risk of interaction with an anchor spread is high, therefore reducing the risk of such interaction occurring. Other mitigation measures would also be required to minimise the level of risk,

including the promulgation of information regarding construction and maintenance activities and details of subsea anchor spreads. As per Section 13, a guard vessel will also warn any approaching vessels of the safety zones and ongoing works, including any deployed anchor spreads. This would allow mariners to account for the presence of anchors when passage planning.

11.4 Protecting Moray East Personnel

Throughout the construction phase and during periods of major maintenance of the Development there shall be a significant number of Moray East personnel working in the Moray East site and surrounding area. Given the collision and allision risk (see Section 11.1 and Section 11.2, respectively) there is a risk (albeit a low level and infrequent risk) of loss of life or injury to both Moray East personnel and the crews of passing vessels.

As per Section 8, an SOV equipped with a "walk to work" system will be utilised during the construction and operation and maintenance phases. The implementation of 500 m safety zones at any structures that the SOV is attached to or on station next to would provide additional protection to the associated personnel, particularly during the "walk to work" operations.

The implementation of mandatory 500 m safety zones in conjunction with other mitigation measures such as the use of a guard vessel would ensure that vessels are able to passage plan effectively in order to pass the Development at a safe distance, thus minimising the risk to the crew.

11.5 Reduction in Fishing Gear Snagging Risk

Fishing vessels represented approximately 24% of traffic throughout the 2018 survey data, corresponding to approximately three unique fishing vessels per day (see Section 10). Both anchor spreads of vessels associated with the construction works at the site and pre commissioned wind farm structures pose a risk to fishing vessels snagging their gear, which could have severe consequences including the capsize of the vessel.

The implementation of mandatory 500 m safety zones during construction or major maintenance activity (or 50 m for pre commissioning structures) in conjunction with other mitigation measures such as the use of a guard vessel and the MCC, a buoyed construction area and charting of the Moray East site would increase awareness of the ongoing works and allow fishermen to passage plan effectively to avoid the Development, therefore reducing the likelihood of a gear snagging incident.

Were a fishing vessel to approach or infringe a safety zone, contact would be made by the guard vessel to identify the area of danger to the fishing vessel, thus reducing the risk of a gear snagging incident.

11.6 Accounting for Inexperienced Mariners

As shown in Section 10, although recreational vessels were infrequent throughout the 2018 survey data, there was recreational activity recorded in the 2010 NRA survey data, and therefore it must be assumed that some recreational vessels may pass in proximity to the Development. Additionally, there may be non-AIS recreational traffic in the area.

Recreational users may not be experienced mariners or hold many formal marine qualifications. Furthermore, recreational craft generally do not carry as high a standard of navigational equipment as commercial vessels since there is no requirement for them to do so. Therefore there is a need to mitigate against the potential lack of marine experience and reduced navigational equipment on board recreational vessels.

The implementation of mandatory 500 m safety zones during construction or major maintenance activity (or 50 m for pre commissioning structures) in conjunction with other mitigation measures such as the use of a guard vessel and the MCC, a buoyed construction area and charting of the Moray East site would increase awareness of the ongoing works. This is particularly important for recreational users since inexperienced mariners may not be equipped to effectively assess their distance from a safety zone.

As previously, were a recreational vessel to approach or infringe a safety zone, contact would be made by the guard vessel to identify the area of danger to the recreational vessel.

11.7 Accounting for Unforeseen Risk

Throughout the construction phase and periods of major maintenance of the Development there is potential for a number of events to occur which may result in previously unforeseen risk. Examples of such events include:

- Fire/explosion on board a construction or major maintenance vessel;
- Machinery failure on board a construction or major maintenance vessel;
- Cargo shifting on board a construction or major maintenance vessel;
- Dropped object;
- Structure failure of a wind farm component;
- Unanticipated adverse weather; and
- Accidental interaction with unexploded ordnance or a wreck.

Any of these events could lead to severe consequences upon both people and the environment. By implementing mandatory 500 m safety zones during construction or major maintenance activity the risk of a third party vessel becoming involved in any of these events would be reduced. This in turn would reduce the overall severity of consequence for any potential incident.

12 Potential Construction / Safety Zone Impacts

This section considers the potential risks to shipping and navigation identified due to the presence of safety zones for the construction and operation and maintenance phases of the Development.

12.1 Passing Traffic

As shown in Section 10, vessel traffic on the main route within the region generally pass at a safe distance to the east of the Development and therefore vessels using this route are not anticipated to be significantly impacted by the presence of safety zones within the site. However the 2018 survey data did indicate a less trafficked route which passes through the Moray East site; to avoid infringing upon a safety zone such traffic would have to re-route. Assuming effective promulgation of information and given the sea room available to the east of the Moray East site for a deviation there are no significant impacts anticipated for passing traffic.

12.2 Fishing Vessels

As seen in Section 10, the level of fishing activity compared to other areas of the United Kingdom (UK) was fairly low, with a large proportion of the fishing vessels in the area in transit rather than actively engaged in fishing activities. The site is, however, of moderate importance in the region as a scallop fishery.

Moray East will have a Commercial Fisheries Mitigation Strategy (CFMS) in place and a fishing liaison officer will be appointed to liaise with the local fisheries community. Additionally, it is anticipated that only three 500 m safety zones would be active at any given time, with vessels free to utilise other areas of the Moray East site away from the active work (noting that 50 m pre-commissioning safety zones are not anticipated to have any significant impact based on their radius).

Consequently the presence of safety zones is not anticipated to cause any significant impact upon fishing productivity.

12.3 Recreational Vessels

As discussed in Section 10, the level of recreational vessel activity was low, particularly in the 2018 NRA survey data. However there was some recreational traffic recorded in the 2010 survey data, and so this should be considered alongside any non-AIS recreational traffic in the area.

Given the presence of the buoyed construction area as a mitigation measure to indicate that vessels should pass around the Development, it is not anticipated that safety zones would have any additional impact upon recreational vessels.

13 Promulgation, Monitoring and Policing

13.1 Promulgation of Information

The deployment of a safety zone shall be promulgated in publications such as (but not limited to) Notice to Mariners, Radio Warnings and Kingfisher bulletins. Moray East will have regular contact with fishing stakeholders through Commercial Fisheries Working Group meetings and the company FLO. Further details will be found in the Navigation Safety Plan (NSP), which will be made available by Marine Scotland once complete.

13.2 Monitoring

All development vessels will be supplied with safety zone procedures.

Whenever an active safety zone is in place, an on-site vessel will be assigned guard duties, including the responsibility to monitor the safety zones, and the surrounding area, via Radar, AIS, VHF communications and visual observations. This will be either a dedicated guard vessel, or, if no guard vessel is being utilised at the time, another on-site vessel (performing non-critical duties and not restricted in its ability to manoeuvre).

It is assumed that other on-site vessels will also be keeping a watch as required under Rule 5 of COLREGS (IMO, 1972).

Where a third party vessel is observed to be approaching the Moray East site, early contact will be made by the designated on-site vessel to advise the passing vessel of the construction/maintenance work underway, and alert them to the presence of the safety zone(s). Where a third party vessel is observed to enter or come in close proximity to an active safety zone, the designated on-site vessel will make contact using standard marine procedures to inform the vessel it has, or is close to, infringing an active safety zone. The vessel will be warned to increase their passing distance, and instructed against entering in the future.

Direct navigational advice will not be given to any third party vessel, with COLREGS (IMO, 1972) remaining as the navigational priority for all vessels.

13.3 Policing

Where feasible, details and actions of any vessels which consistently ignore the warnings issued by the development and are considered to be causing a potential danger to vessels (including their own vessels), personnel or assets within the safety zone areas will be monitored and action (including steps taken) recorded. The safety zones supplement more general regulations that are applicable to all sea users including The Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996 which implement COLREGS (IMO, 1972). These general regulations remain in force and require vessels to take appropriate action when encountering vessels that are RAM as well as the presence of safety zones. Any infringements of the safety zone or unsafe navigational acts (as required under the relevant regulations implementing international conventions) will be reported to the relevant authorities.

It is also acknowledged that assistance measures under Regulation 33 of Safety of Life at Sea (SOLAS) (IMO, 1974) remain valid and a third party vessel is obliged to render assistance to another vessel in trouble even if entry into a safety zone is required.

14 Summary

Within the NRA for the Moray East Offshore Wind Farm the use of safety zones was identified as a mitigation measure required in order ensuring that the significance level of each shipping and navigation impact was As Low As Reasonably Practicable (ALARP). This document provides the necessary information to support the following safety zones:

- Mandatory "rolling" 500 metres (m) safety zones during the construction phase established around each wind farm structure (both WTGs and OSPs and / or their foundations whilst construction works are in progress, as indicated by the presence of a construction vessel.
- Mandatory pre commissioning 50 m safety zones during the construction phase established around each wind farm structure (both WTGs and OSPs) and / or their foundations when construction works have been completed but prior to the commissioning of the Development.
- Mandatory 500 m safety zones during the operation and maintenance phase around all major maintenance work being undertaken.

No more than three 500 m safety zones (worst case) will be active at any given time. Multiple 50 m pre commissioning safety zones will be deployed at any one time.

Overall the construction phase is anticipated to take a total of 31 months between March 2019 and October 2021. During the construction phase a large number of vessels, some of which shall be RAM, shall be present and undertaking multiple works which overlap in duration. This shall also be the case for periods of major maintenance during the operation and maintenance phase. Throughout both phases, the Development shall be marked and charted as required by NLB.

An analysis of recent AIS data (2018) correlated well with the AIS data which was analysed in the NRA (2010). It can be concluded from the data that the vessel traffic in the region has not changed significantly from the time of the NRA submission. Although the data suggests that there are only likely to be minor impacts as a result of the Development, the safety zones shall assist with the following:

- Reduction in the likelihood of a collision incident between a construction or maintenance vessel and a third party vessel;
- Reduction in the likelihood of an allision incident between a third party vessel and a wind farm structure;
- Reduction in the risk of an interaction between the anchor spread of a construction or maintenance vessel and a third party vessel;
- Protecting Moray East personnel from passing traffic;
- Reduction in the likelihood of a fishing vessel snagging its gear;
- Accounting for inexperienced mariners; and
- Accounting for unforeseen risks.

Mandatory safety zones shall be implemented alongside a range of other mitigation measures such as a buoyed construction area, charting of the Moray East site, provision of a guard vessel and MCC to monitor and police activities and promulgation of information. Together these mitigations shall ensure that the risks are within ALARP parameters.

Safety zones shall be monitored via radar, AIS, VHF communications, and visual observations by a designated on-site vessel at all times, with infringing activity or unsafe navigational activity reported to the relevant authorities as required.

Details of the locations and times at which each safety zone will be active will be promulgated in advance of implementation.

15 References

Anatec (2010). *Navigational Risk Assessment – Moray East Offshore Wind Farm*. Aberdeen: Anatec.

Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007. Available at http://www.legislation.gov.uk/uksi/2007/1948/contents/made (accessed June 2018).

Electricity Act 1989. Available at: https://www.legislation.gov.uk/ukpga/1989/29/section/36 (accessed June 2018).

Energy Act 2004 (c.20). Available at: https://www.legislation.gov.uk/ukpga/2004/20/contents (accessed June 2018).

IMO (1972 as amended). Convention on the International Regulations for Preventing Collisions at Sea. London: IMO.

Marine (Scotland) Act 2010. Available at: https://www.legislation.gov.uk/asp/2010/5/section/25 (accessed June 2018).

Moray Offshore Windfarm (East) Limited (2018). Construction Programme and *Construction Method Statement document*. Edinburgh: Moray Offshore Windfarm (East) Limited.

Moray Offshore Windfarm (East) Limited (2019). *Development Layout and Specification Plan*. Version 3, January 2019. Edinburgh: Moray Offshore Windfarm (East) Limited.

Moray Offshore Windfarm (East) Limited (2018). *Emergency Response Cooperation Plan (In Preparation but based on standard guidance)*. Edinburgh: Moray Offshore Windfarm (East) Limited.

Moray Offshore Windfarm (East) Limited (2018). *Emergency Response Plan*. Edinburgh: Moray Offshore Windfarm (East) Limited.

Moray Offshore Windfarm (East) Limited (2018). *Lighting and Marking Plan*. Edinburgh: Moray Offshore Windfarm (East) Limited.

Moray Offshore Windfarm (East) Limited (2018). *Navigational Safety Plan/Vessel Management Plan (In Preparation but based on standard guidance)*. Edinburgh: Moray Offshore Windfarm (East) Limited.

The Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996. Available at: http://www.legislation.gov.uk/uksi/1996/75/contents/made (accessed June 2018).

MORAY EAST
OFFSHORE WINDFARM

Contact

Moray Offshore Windfarm (East) Limited
5th Floor, Atria One, 144 Morrison Street
Edinburgh EH3 8EX
Tel: +44 (0)131 556 7602