

EUROPEAN OFFSHORE WIND DEPLOYMENT CENTRE

Safety Zone Application – Including Supporting Safety Case ABE-ENV-QB-0015

Prepared by:	Anatec Ltd and Esther Villoria	Environment and Consents Manager		31/08/2017
	NAME	ROLE		DATE
Reviewed by:	Jim Green	HSSE Manager		22/09/2017
	NAME	ROLE		DATE
Approved	25.09.2017	00	Adam Ezzamel	
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Defined Terms

Term	Definition/Description
Application	The Application and Environmental Statement submitted to the Scottish Ministers, by the Company on 1 st August 2011 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 6 th August 2012 for consent under section 36 of the Electricity Act 1989 and for a Marine Licence under 20(1) of the Marine (Scotland) Act 2010, for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC) electricity generating station approximately 2 km off the coast of Aberdeenshire in Aberdeen Bay with a generation capacity of up to 100 MW.
Company	Aberdeen Offshore Wind Farm Limited (AOWFL). AOWFL is wholly owned by Vattenfall and has been established to develop, finance, construct, operate, maintain and decommission the European Offshore Wind Deployment Centre.
Construction	As defined by the Section 36 Consent, (as per section 64(1) of the Electricity Act 1989, read with section 104 of the Energy Act 2004), construction is defined as follows: “construct”, in relation to an installation or an electric line or in relation to a generating station so far as it is to comprise renewable energy installations, includes: <ul style="list-style-type: none"> • placing it in or upon the bed of any waters; • attaching it to the bed of any waters; • assembling it; • commissioning it; and • installing it.
Contractor	Any Contractor/Supplier (individual or firm) working on the project, hired by AOWFL.
Design Statement (DS)	The Statement to be submitted for approval under Condition 14 of the section 36 Consent.
Development	The European Offshore Wind Deployment Centre electricity generating station in Aberdeen Bay, approximately 2 km east of Blackdog, Aberdeenshire, as described in Annex 1 of the section 36 Consent.
Electricity Act	the Electricity Act 1989 (as amended).
Inter-array cables	Electricity cables connecting the WTGs.
Licensing Authority	Scottish Ministers, as defined by the Marine Licence. It is important to note that Marine Scotland is acting on behalf of

Term	Definition/Description
	Scottish Ministers.
Marine Licence	Licence issued by the Scottish Ministers under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Offshore Export Cable.
Navigational Safety Plan (NSP)	The Plan submitted for approval under Condition 26 of the section 36 Consent.
Offshore Export Cables (OECs)	The offshore export cables (and all associated cable protections) connecting the Wind Turbine Generators to the onshore export cables.
Offshore wind farm	An offshore generating station which includes proposed WTGs, inter-array cables, meteorological masts and other associated and ancillary elements and works (such as metocean buoys). This includes all permanent and temporary works required.
Onshore Export Cables	The cables connecting the offshore export cables from the land fall to the onshore substation.
Section 36 Consent	Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC.
Scottish Marine Area	The area of sea within the seaward limits of the territorial sea of the United Kingdom adjacent to Scotland and includes the bed and subsoil of the sea within that area.
Vessel Management Plan (VMP)	The Plan submitted for approval under Condition 24 of the Section 36 Consent.

Acronym Definitions

Term	Definition/Description
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AOWFL	Aberdeen Offshore Wind Farm Limited
BEIS	The Department of Business Energy and Industrial Strategy.
CAA	The Civil Aviation Authority
CoS	Chamber of Shipping
EDS	Electricity Distribution Services
Electricity Act	the Electricity Act 1989 (as amended)
EOWDC	European Offshore Wind Deployment Centre
ERCoP	The Emergency Response and Cooperation Plan
ERP	Emergency Response Plan
FSA	Formal Safety Assessment
GLA	General Lighthouse Authority
HLV	Heavy Lift Vessels
HV	High Voltage
KIS ORCA	Kingfisher – Offshore and Marine Renewables
km	Kilometre
LAT	Lowest Astronomical Tide
m	Metre
MC	Marine Coordinator
MCA	The Maritime and Coastguard Agency
MOD	Ministry of Defence
MHWS	Mean High Water Spring
MS	Marine Scotland
MW	Megawatt
NLB	Northern Lighthouse Board

Term	Definition/Description
NMP	Navigational Marking Plan
NRA	Navigation Risk Assessment
NSP	Navigational Safety Plan
NtM	Notice to Mariners
OEC	Offshore Export Cables
RAM	Restricted in their Ability to Manoeuvre
SAR	Search and Rescue
SCADA	Supervisory Control and Data Acquisition
SNH	Scottish Natural Heritage
SOLAS	Safety of Life at Sea Convention
SPS	Significant Peripheral Structure
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WTG	Wind Turbine Generator

1 INTRODUCTION

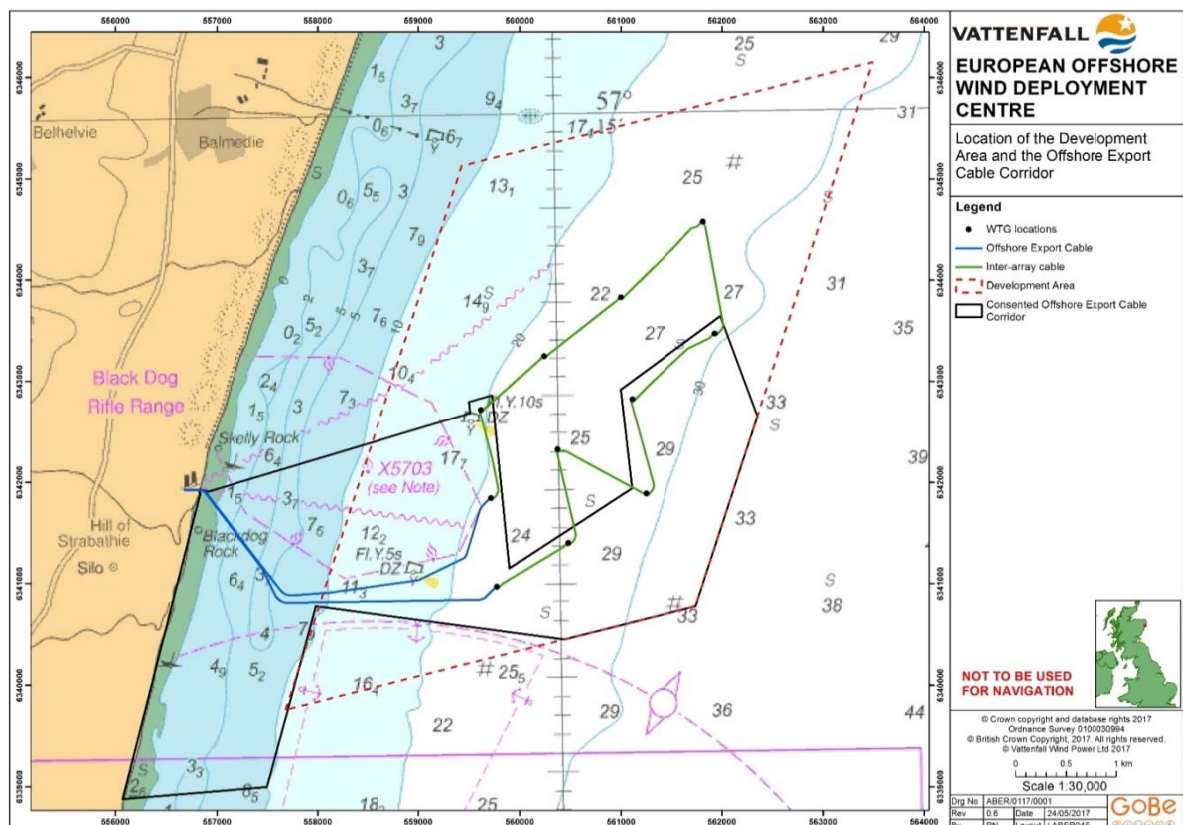
1.1 Background

On 26 March 2013, Aberdeen Offshore Wind Farm Limited (AOWFL) received consent from the Scottish Ministers under Section 36 (S.36) of the Electricity Act 1989 for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC - also known as the Aberdeen Offshore Wind Farm) and on 15 August 2014 a Marine Licence was attained under section 25 of the Marine (Scotland) Act 2010 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

The EOWDC is located approximately 2 to 4.5 kilometres (km) offshore to the north east of Aberdeen, Scotland, within Aberdeen Bay. The Offshore Export Cables (OEC) will be between 3.7 - 4 km long and will reach landfall at Blackdog, Aberdeenshire (Figure 1). A further overview of the Development is contained in Section 3 of this document.

AOWFL is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain, and decommission the EOWDC.

Figure 1 - Location of the Development Area and the consented Offshore Export Cable Corridor



1.2 Objectives of this Document

This document has been prepared as the primary supporting documentation to the Safety Zone Application for the EOWDC, which will be made to Marine Scotland in accordance with 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. The purpose of the proposed safety zones is to manage potential interactions between third party vessels and the EOWDC construction and maintenance activities; with a view to minimising the risk of an incident which may threaten life, the environment and / or assets.

The safety zones which shall be applied for are summarised below.

1.2.1 Construction Phase

An application is being made for safety zones of 500 metres (m) around Wind Turbine Generators (WTGs) where construction works are taking place that include sensitive activities being undertaken by vessels Restricted in their Ability to Manoeuvre (RAM). The placement of safety zones will prohibit other marine users¹ (not related to the construction of the Development) from entering the designated safety zone area, with the exception of emergency incidents. Vessels engaged in construction activities will enter with permission of the Marine Coordinator. Safety zones will be indicated by the presence of construction vessels, presence of a guard vessel² and supporting Notice to Mariners to provide notice of their presence. The safety zones will roll³ with the construction activity as required and the presence of safety zones will be promulgated by notices and verbally via the guard vessel. During the construction phase, it is anticipated that of the 11 WTGs, no more than two will have 500 m safety zones at any given time.

In addition, smaller 50 m safety zones are applied for around the following infrastructure:

- Partially completed WTGs where work is not underway and risk assessments identify a need; and
- Completed WTGs prior to commissioning and as required by a risk assessment process.

1.2.2 Operational and Maintenance Phase

During the operational phase, an application is being made for safety zones of 500 m around all “major maintenance” work associated with the Development. Major maintenance is defined as any activity requiring the use and presence of large construction vessels that are RAM. The presence of the RAM vessel, the presence of a guard vessel and promulgation of a Notice to Mariners shall indicate the deployment of a safety zone.

No safety zones will be applied for during normal operations.

¹ Other marine users could include commercial vessels, commercial fishing vessels or recreational users such as sailing vessels, motorised recreational vessels or personal watercraft.

² Or other nominated vessel

³ Rolling indicates the safety zone will move with the activity and construction (RAM) vessels. Therefore it is unlikely that multiple safety zones will be present at any one point.

1.2.3 Decommissioning Phase

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

1.2.4 Export Cable and Inter Array Cables

It should be noted that the safety zone scheme does not cover the OEC or inter-array cables, or parts thereof, located outside an approved safety zone (around a WTG installation).

1.3 Safety Zone Application Authority

It is noted that on the 1st April 2017, Marine Scotland (MS) took responsibility for the safety zone application process from the Department for Business, Energy, and Industrial Strategy (BEIS). Therefore this application is submitted to MS.

1.4 Anatec Ltd Background

This document supporting the safety zone application has been authored by Anatec Ltd on behalf of AOWFL. Anatec has assisted in successful safety zone application processes for various offshore renewable installations including, as examples, those listed below:

- Beatrice Offshore Wind Farm;
- Walney (including Extension) Offshore Wind Farm;
- London Array Offshore Wind Farm;
- Gunfleet Sands Demonstrator;
- West of Duddon Sands Offshore Wind farm; and
- Burbo Bank Extension Offshore Wind Farm.

During this application process Anatec has also sought the advice of the Maritime and Coastguard Agency (MCA) and the Northern Lighthouse Board (NLB) as the primary regulators.

2 COMPLIANCE WITH RELEVANT LEGISLATION

This document is generated to support the requirements of the safety zone application and therefore this section includes where legislation has been met. 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 require that specific information should be included within a written application for safety zones in respect of an offshore generating station. The following tables detail where that information has been included within the supporting document.

Table 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)	(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; and (b) the waters in relation to which any declaration applied for will establish a safety zone.	Coordinates of the turbines are included in Table 4, and plotted in Figures 1 and 3.
3(2)	(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 ⁴ .	See Table 2 for requirements under the Electricity Act 2007.
3(3)	An application is not allowed to be made orally.	This document forms the written application to be made to Marine Scotland

⁴ Note application is being made to Marine Scotland.

**Table 2 Statutory Instrument 2007 No. 1948 The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 Regulation 3 -
– completion of requirement**

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;	See <i>Section 6</i> Project Components, which includes Table 5 showing key parameters.
	(ii) a description of how the installation operates (or is to operate);	See <i>Section 7</i> construction overview which details the installation processes, and <i>Section 8</i> which provides an overview of the operation and maintenance phase.
	(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;	Figures 1 and 3 show the OEC and inter-array cables.
	(iv) a description of the location (or proposed location) of any offshore sub-station housing connection equipment;	Not applicable, as offshore substations are not proposed to be installed.
	(v) where the zone is sought in respect of more than one relevant renewable energy installation, the proposed or existing distances between such installations; and	The minimum turbine spacing is given in Table 5.
	(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.	Navigational marking is included within <i>Section 9</i> and includes lighting and marking during the construction and operational phase.
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;	See <i>Section 1.2</i> Objective of this Document that details the safety zones being applied for during the construction phase and during periods of major maintenance in the operations phase.
	(ii) whether the applicant seeks the declaration of a standard safety zone, or if not, what dimensions are sought for that zone;	The applicant seeks the declaration of standard safety zones used throughout the Renewable Energy Zone.

Item	Requirement	Where Addressed within this Document
	(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 presence of safety zones will be risk assessed. Presence of and duration will be promulgated as per <i>Section 13 – Promulgation, Monitoring and Policing</i>
	(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, no variations to standard safety process.
	(v) whether the zone relates to major maintenance works in respect of a relevant renewable energy installation which has become operational;	As per <i>Section 1.2.2</i> this application also covers major maintenance safety zones.
	(vi) a statement setting out what steps, if any, the applicant proposes to take to monitor vessels and activities within the zone; and	Monitoring procedures are detailed in <i>Section 13 – Promulgation, Monitoring and Policing</i> .
	(vii) except where the appropriate minister has notified the applicant that it is not required, an up to date shipping traffic survey for the waters comprising the zone; and	An updated Marine Traffic Survey Data is included within <i>Section 10</i> .
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.	<i>Section 11</i> includes the risk assessment for safety zones, with potential impacts on marine activity given in <i>Section 12</i> .

Table 3 Statutory Instrument 2007 No. 1948 The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 Regulation 4 - completion of requirement

Item	Requirement	Where Addressed on this Document
4(1)	<p>(1) The applicant shall publish notice of an application –</p> <p>(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;</p> <p>(b) in Lloyd’s list and in one or more national newspapers</p> <p>(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;</p> <p>(e)⁵ 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 Zone⁶, the Edinburgh Gazette</p>	<p>Notice of the application will be published as follows:</p> <p>(a) In the Evening Express and the Press and Journal.</p> <p>(b) In the Lloyd’s list and in the Herald. It is noted that it was agreed with Marine Scotland that a Scottish paper, rather than a UK-wide publication, was more appropriate based on the Project location.</p> <p>(c) In the Fishing News.</p> <p>(e) In the Edinburgh Gazette.</p>
4(2)	<p>(2) The applicant shall, at the same time as publishing the notice under paragraph (1)(a), send a copy of the notice to-</p> <p>(a) the harbour masters of ports whose users are, in the opinion of the applicant, likely to be affected by the application;</p> <p>(b) the sector office of the MCA which is responsible for operations in the waters in which the safety zone is proposed or located⁷; and</p> <p>(c) the local office of the Marine and</p>	<p>Notice of the application and a request that the notice be displayed at an address accessible during normal working hours to members of the public likely to be affected by the application for at least 14 days will be sent to:</p> <p>(a) Aberdeen Harbour Master</p>

⁵ Points (d) and (f) relate to safety zones located in non-Scottish waters, and are therefore not applicable to the EOWDC.

⁶ “Scottish waters” is defined in section 104(1) of the Energy Act 2004 as internal waters of the United Kingdom that are in or adjacent to Scotland or so much of the territorial sea of the United Kingdom as is adjacent to Scotland. The “Scottish part” of the Renewable Energy Zone was designated by the Renewable Energy Zone (Designation of Area) (Scottish Ministers) Order 2005 (S.I. 2005/3153).

⁷ Noting areas and control of sector offices has changed since the publication of this legislation.

Item	Requirement	Where Addressed on this Document
	<p>Fisheries Agency which is responsible for operations in the waters in which the safety zone is proposed or located,</p> <p>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.</p>	<p>(b) the MCA Search and Rescue (SAR) Liaison office stationed in Aberdeen</p> <p>(c) As there is no Inshore Marine and Fisheries Agency covering Scotland, notice of the application will be sent to local fishing stakeholders via the Scottish Fishermen's Federation.</p>

3 DEVELOPMENT OVERVIEW

The Development will consist of the following main components:

- 11 WTGs;
- Three-legged jacket each installed on suction bucket foundations;
- A network of circa 9.7 km of Inter-array cables, buried or mechanically protected, subsea cables to connect strings of turbines together;
- Two buried or mechanically protected, subsea OECs, totalling up to ~8 km in length, to transmit the electricity from the WTGs to the cable landfall location at Blackdog, within Aberdeen Bay, and connecting to the buried onshore export cables for transmission to the onshore substation and connection to the National Grid network.

Further details of the Development layout and design have been set out, for approval, in the Design Statement (DS) (ABE-ENV-BD-0017). The main components of the Development are presented in Figure 1.

4 DEVELOPMENT SCHEDULE

The indicative offshore construction schedule of the Development is summarised in Table 4 (noting that this may be subject to change due to unforeseen circumstances, final project engineering works and weather delays).

Table 4 – Indicative Construction Schedule

Milestone or Activity	Anticipated Installation Period
Commencement of the Development	October 2017
Landfall works	October 2017 to February 2018
Scour protection installation	October 2017 to December 2017
Installation of jacket substructures on suction bucket foundations	November 2017 to March 2018
Installation of offshore export cables	October 2017 to February 2018
Installation of Inter-array cables	December 2017 to March 2018
Installation of WTGs	March 2018 to September 2018
Offshore construction ends/ Completion of the Works	May 2018 to September 2018

5 WIDER CONTEXT

The Safety Case supporting this Safety Zone application represents one of the post consent documents relating to navigational safety which has been prepared for the EOWDC. Other relevant documentation is summarised below.

5.1 Emergency Response and Cooperation Plan

The Emergency Response and Cooperation Plan (ERCoP) (ABE-HSS-QB-0045) provides information and procedures relating to emergency response. Content includes:

- Emergency contacts;
- Role of AOWFL;
- Role of Her Majesty's Coastguard;
- Relevant Search and Rescue (SAR) Facilities;
- Medical Advice;
- Firefighting, Chemical Hazards, Trapped Persons;
- Next-of-Kin Arrangements; and
- Media Relations.

5.2 Emergency Response Plan

The Emergency Response Plan (ERP) (ABE-HSS-QB-0004) has been prepared in accordance with AOWFL's Safety, Health and Environmental Management System. The ERP details the required emergency planning and response control measures to be implemented across the Construction and Operational phases of the EOWDC by all AOWFL Personnel, Contractors and Subcontractors.

Procedures are set out in the ERP against a number of emergency scenarios to ensure the following provisions are in place in the event of an incident:

- Define how emergencies are reported from where they occur, the local action required, the involvement of the emergency services and what roles and responsibilities are taken up and by who;
- Explain how the different levels of command & control are carried out;
- Standardise the way that responses are carried out in the event of an emergency including emergency command centre facilities;
- Form a sound basis for training people (including Key Contractors and Subcontractors) within their level of command & control;
- Provide a constructive information tool to help people understand their role and responsibilities during an incident; and,
- Ensure compliance with safety, health and environmental legislation.

5.3 Navigational Safety Plan

The Navigational Safety Plan (NSP) (ABE-ENV-QB-0008) has been prepared to satisfy Condition 26 of the S36 Consent:

Prior to the Commencement of the Development, a Navigational Safety Plan must be submitted to, and approved by, the Scottish Ministers in consultation with the Maritime and Coastguard Agency (MCA), the Northern Lighthouse Board (NLB), Aberdeen Harbour Board, the Chamber of Shipping (CoS) and any other navigational advisors, or such other advisors, as may be required at the discretion of the Scottish Ministers.

Contents of the plan include:

- Navigational safety measures;
- Proposed Safety Zones;
- Notice to Mariners (NtM) and Radio Navigational Warnings;
- Navigational Buoyage;
- Anchoring Areas; and
- Navigational Lighting and Marking.

5.4 Navigational Marking Plan

The Navigational Marking Plan (NMP) (ABE-ENV-BD-0009) sets out the lighting and marking to be implemented during the construction and operational phase of the Development:

- Navigational Buoyage;
- Navigation and Aviation Lighting and Marking;
- Navigation and Aviation Signage; and
- Requirements for Automatic Identification System (AIS) carriage.

5.5 Vessel Management Plan

The Vessel Management Plan (VMP) (ABE-ENV-BD-0006) has been prepared to satisfy Condition 24 of the S36 Consent:

Prior to the Commencement of the Development, a Vessel Management Plan must be submitted to, and approved by, the Scottish Ministers in consultation with Scottish Natural Heritage (SNH) and any such other ecological or other advisors as may be required at the discretion of the Scottish Ministers.

The purpose of the VMP is primarily to ensure that vessel disturbance to local marine mammals and ornithology is minimised. Contents of the plan include:

- Vessel details (numbers and movements);
- Details of vessels using ducted propellers;
- Coordination of vessel management; and
- Details of working (construction and operational) ports.

5.6 Firing Range Management Plan

The Firing Range Management Plan (ABE-ENV-DB-0013) has been prepared to satisfy Condition 10 of the S36 Consent:

Prior to the erection of any wind turbines on the Site, the Company must submit a Black Dog Firing Range Management Plan ("Management Plan") to the Scottish Ministers for their written approval, following consultation by the Scottish Ministers with the Ministry of Defence (MOD). To ensure that the safety of vessels, installations and personnel deployed within the offshore danger area (X5703) whilst range activities are not compromised the Management Plan must identify the operational procedures requiring to be implemented by the Company. The Company must meet all costs attributable to the delivery of the Management Plan. The Company must comply with all operational procedures under the Management Plan.

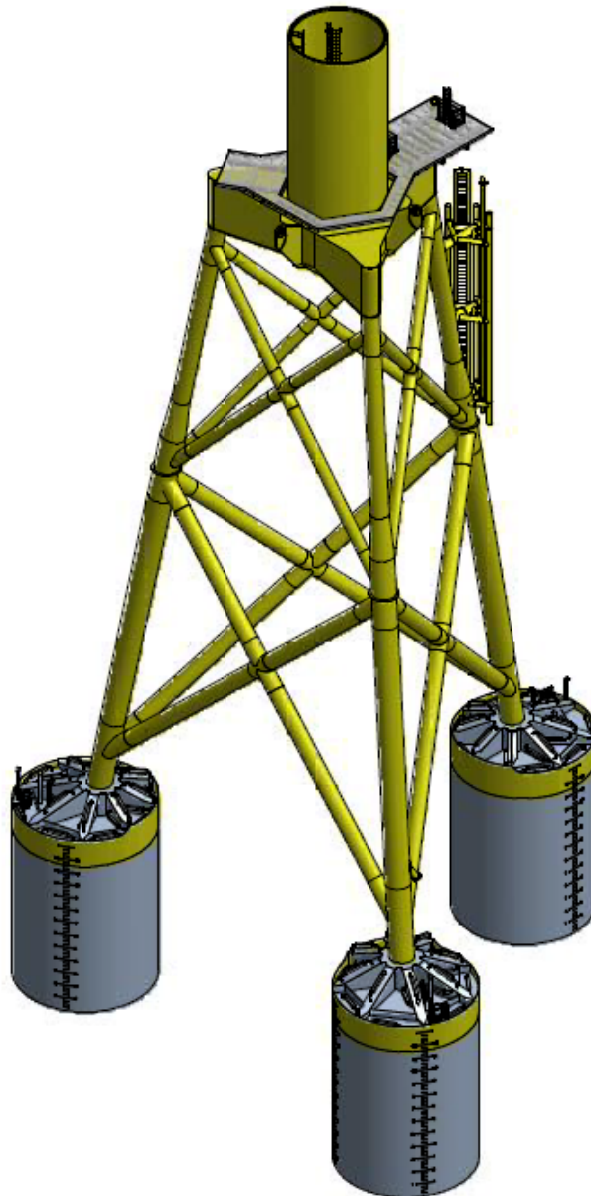
The plan provides procedures to be followed by all AOWFL associated vessels to minimise disturbance to activities at the Firing Range and to ensure the safety of vessels/crew/personnel.

6 PROJECT COMPONENTS

6.1 Foundations

The foundations for the WTGs will comprise three suction buckets per WTG, with a jacket taking on a tubular steel lattice structure, as shown in Figure 2.

Figure 2 - Foundations and Jacket (Figure courtesy of Boskalis)



6.2 Wind Turbine Generators

The Development will consist of 11 WTGs, each with a unique ID identifier (AWF01 to AWF11), as illustrated in Figure 3. The coordinate positions of each WTG are given in Table 5, with key specifications then given in Table 6. The location of each of the WTGs may be subject to slight amendment due to, for example, the need to avoid Unexploded Ordnances (UXOs), local seabed restrictions such as archaeology features, or other seabed

obstructions. It should be noted that a 100 m radius allowance for such micro-siting of the WTGs was included within the consent application applied (Layout Reference LABER044) and is permissible under the terms of the consents granted.

Table 5 - WTG Coordinates (WGS84)

Turbine	Latitude	Longitude
AWF01	57° 13' 25.226" N	002° 0' 45.453" W
AWF02	57° 13' 42.152" N	002° 0' 7.902" W
AWF03	57° 14' 0.616" N	001° 59' 22.233" W
AWF04	57° 14' 24.310" N	001° 58' 33.059" W
AWF05	57° 12' 56.899" N	002° 0' 40.259" W
AWF06	57° 13' 12.197" N	002° 0' 0.801" W
AWF07	57° 13' 27.892" N	001° 59' 16.426" W
AWF08	57° 13' 48.536" N	001° 58' 27.007" W
AWF09	57° 12' 28.585" N	002° 0' 37.615" W
AWF10	57° 12' 42.251" N	001° 59' 55.259" W
AWF11	57° 12' 57.630" N	001° 59' 9.030" W

Table 6 - WTG Summary

Turbine Manufacturer	MHI Vestas
Number of Turbines	11
Rotor radius	82 m
Number of blades	3
Hub height (above LAT)	109 m
Tip height (above LAT)	191 m
WTG tip height (above LAT)	191 m
Minimum Spacing	814 m
Lowest point of rote swept above Mean High Water Springs	22 m

6.3 Export and Inter-Array Cables

Two export cables will run from the landfall at Blackdog to the WTGs. The northern cable will connect to AWF06, and the southern cable to AWF09. WTGs are then linked via an inter-array cable network as shown in Figure 3.

7 CONSTRUCTION OVERVIEW

7.1 Introduction

This section provides an overview of the construction phase of the Development. Specific details of the vessels to be used during construction are given in the VMP (ABE-ENV-BD-0006).

7.2 Foundations

Foundations will be transported via barge from the assembly yard in Newcastle to Peterhead, which will act as a feeder port to the Development during this stage. The barges will be towed by two tugs, assumed to have bollard pull of approximately 90 metric tonnes, however it is noted that the tugs to be used are yet to be determined.

A HLV will transport the foundations from Peterhead to the Development, with eleven transits (a transit includes the return journey) anticipated. The HLV will require to be anchored to the seabed during installation of the foundations, and an anchor handling tug will therefore be required. Each foundation will be scour protected and as per the programme in Table 4 this will be the first activity to take place.

Crew transfer during this stage of the construction will be from Aberdeen, via crew transfer vessels.

7.3 Wind Turbine Generators

The WTGs will be picked up in Esbjerg by the installation vessel, and taken directly to the Development to be installed once the foundations and jackets installation is complete. Three transits between Esbjerg and the Development are currently anticipated during this stage of the installation.

It is anticipated that crew transfer during this stage of construction will be from Aberdeen via helicopter.

7.4 Export and Inter-Array Cables

All cable will be loaded onto the cable installation vessel at JDR facilities in Hartlepool and taken directly to the Development Area. The cable lay vessel will require to be anchored to the seabed during installation and an anchor handling tug is therefore required during this stage of the installation.

Prior to cable installation, surveys (including an Unexploded Ordnance (UXO) survey) and a pre-lay grapnel run will be undertaken.

During cable installation, crew transfers will occur from Aberdeen twice daily using crew transfer vessels.

8 OPERATION AND MAINTENANCE OVERVIEW

During the lifetime of the Development, it is likely that major maintenance will be required on the WTGs, in addition to the planned, regular maintenance. As the maintenance requirements will vary year on year, a comprehensive maintenance schedule cannot currently be defined. As per Condition 3.2.3.5 of the Marine License, an Operation and Maintenance Programme will be provided to the Licensing Authority within three months of the completion of the works.

It is envisaged that the actives given in Table 7 will form part of the programme, however it should be noted that this list is not comprehensive, and that additional activities may be required, included unexpected maintenance.

Table 7 - Maintenance Activities

Maintenance Activity	Company Responsible
Routine and Reactive Maintenance	AOWFL/MHI Vestas
Inspections of Wind Turbines	AOWFL/MHI Vestas
Inspections of Foundations	AOWFL
High Voltage Switching	Electricity Distribution Services (EDS) High Voltage (HV)
Senior Authorised Person Services	EDS HV
Facilities Maintenance and Security	TBC

Throughout periods of major maintenance, 500 m safety zones will be established around WTG whilst maintenance work is being performed, as indicated by the presence of large maintenance vessels and a risk assessment identifying the need. Major maintenance activities are likely to involve large vessels which may be RAM (e.g. jack-ups or HLVs). The need for a safety zone during the maintenance phase will be promulgated by NtMs and radio warnings, and will be indicated by the presence of a RAM vessel and a guard vessel being deployed to the site (see *Section 13*).

9 NAVIGATIONAL MARKING

9.1 Introduction

This section presents the lighting and marking to be implemented on the EOWDC during both the construction and operational phases of the Development. Full details of the lighting and marking are available in the NMP (ABE-ENV-DB-0009).

9.2 Construction Phase Marking

Under international guidance (the International Association of Lighthouses) cardinal marks are deployed by General Lighthouse Authorities (GLA) to warn mariners of navigational safety hazards. For EOWDC the construction phase navigational marking has been directed by the NLB (the Scottish GLA) 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 require them to consider the presence of hazardous activities within their passage. The International Convention for the Safety of Life at Sea Chapter V (SOLAS) as implemented by The Merchant Shipping (Safety of Navigation) Regulation 2002 requires all vessel on all voyages (regardless of their activity) to have a passage plan in place. This must anticipate all known navigational hazards.

All required construction phase buoyage will be established prior to commencement of construction works (in agreement with NLB) with required notification submitted.

During the construction phase, the Development will be marked with four cardinal buoys, as approved by the NLB, and presented in Figure 4. Table 8 provides the location of the required buoyage throughout the construction phase.

During the construction phase, partially completed or commissioned WTGs will be marked with a construction phase navigational light (flashing yellow 2.5 seconds (*Flash (Fl)*). *Yellow (Y)*. 2.5 seconds (s)) with 2 nautical mile (nm) range visible through 360 degrees (°)). Construction lights will be used for navigational marking where risk assessment demonstrates the need for temporary lighting.

The construction phase lighting and marking (buoyage) will remain in place until all operational phase lighting and marking has been inspected and approved by NLB.

Figure 4 - Construction Buoyage

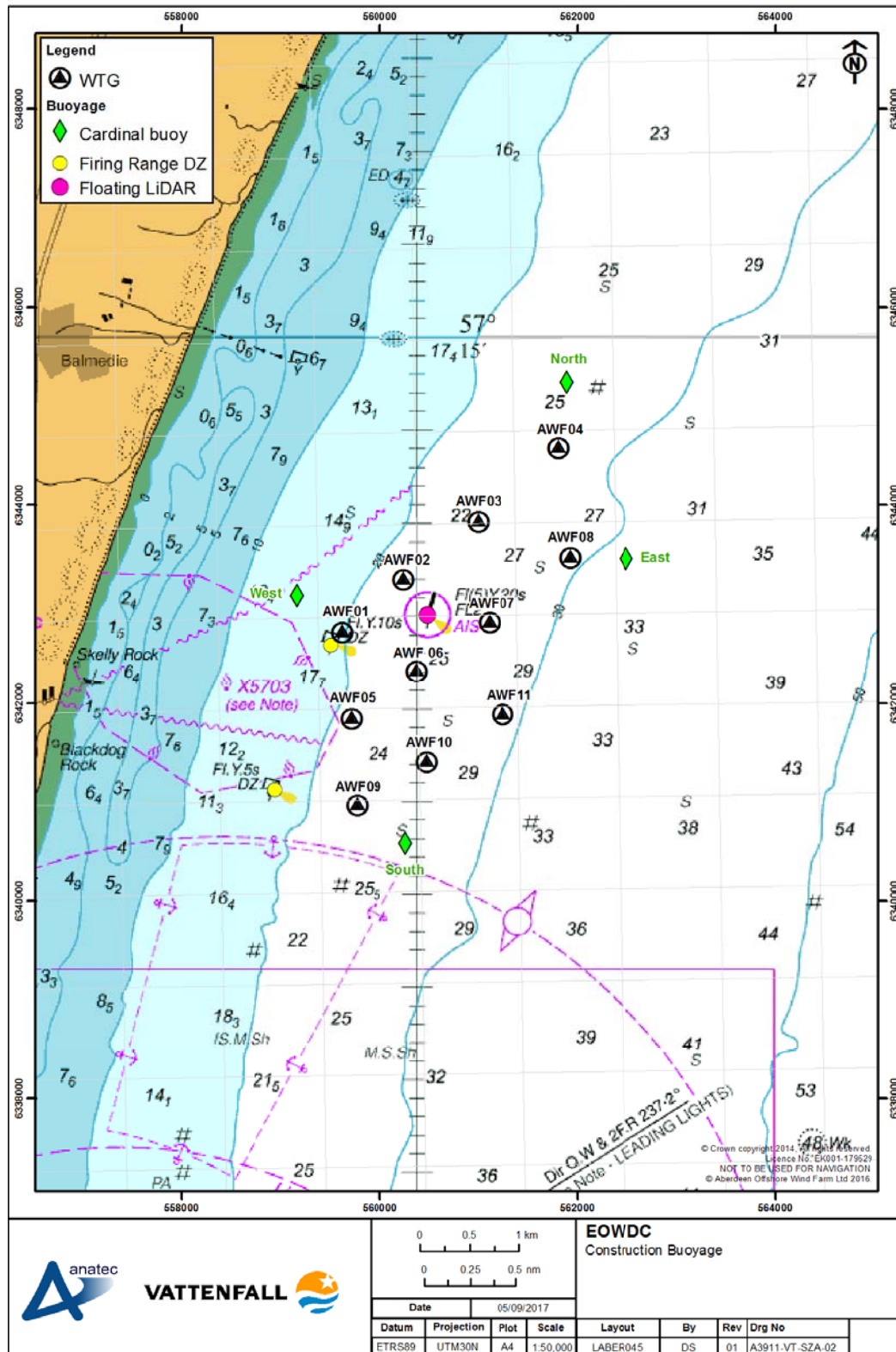


Table 8 - Construction Cardinal Buoy Locations (WGS84)

Buoy	Latitude	Longitude	Details
North	57° 14' 45.78" N	001° 58' 27.56" W	Pillar, Quick (Q) white light character
East	57° 13' 47.95" N	001° 57' 53.15" W	Pillar, Q (3) 10 s white light character
South	57° 12' 15.98" N	002° 00' 08.95" W	Pillar, Q (6) + Long (L) Flash (FL) 15 s white light character
West	57° 13' 37.53" N	002° 01' 11.69" W	Pillar, Q (9) 15 s white light character

9.3 Operational Lighting and Marking

Following consultation with the NLB, it was agreed that buoyage was not required during the operational phase of the Development.

All WTG's designated as a Significant Peripheral Structure (SPS) will be marked with a navigational light, with range dependent on proximity to shore. Three of the WTGs will also be fitted with foghorns to provide sound warnings during periods of poor visibility, and AIS will be fitted on WTGs AWF04 and AWF09.

Aviation lighting will be fitted as required by the CAA and all WTGs shall be lit with a synchronised flashing red Morse code letter 'W'.

All jacket foundations will be painted traffic yellow (RAL 1023) up to a height of 28.46 m above Highest Astronomical Tide (33.1 m above Lowest Astronomical Tide (LAT)). Above this height, structures will be painted light grey (RAL 7035). Any part of the structure that will remain below LAT at all times is not required to be painted. Each WTG will display a unique identification panel with black letters or numbers on a yellow background visible in all directions. The navigational lighting and marking required (as approved by the NLB) throughout the operational phase of the Development is presented in Figure 5. A summary is then presented in Table 9.

Figure 5 - Project Navigation Lighting and Marking - Operation

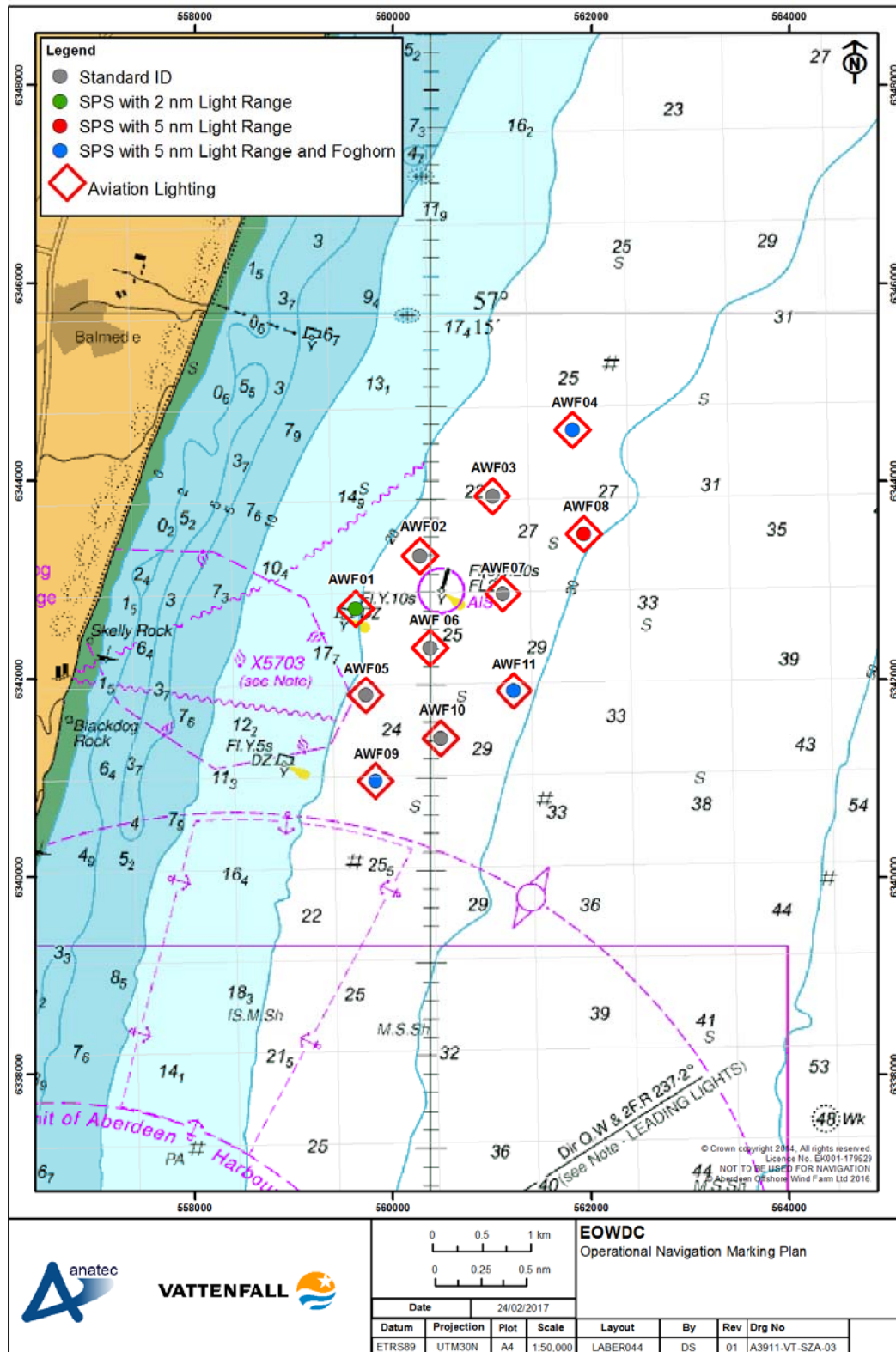


Table 9 - Project Navigation Lighting and Marking Characteristics - Operation

WTG	Marine Lighting	Fog Horn (inc Visibility Metre)	Aviation Lighting	ID Panel	AIS Transmitter
AWF01	Yes – 1/5 second, 2 nm	No	Yes	Yes	No
AWF02	Not required	No	Yes	Yes	No
AWF03	Not required	No	Yes	Yes	No
AWF04	Yes – 1/5 second, 5 nm	Yes	Yes	Yes	Yes
AWF05	Not required	No	Yes	Yes	No
AWF06	Not required	No	Yes	Yes	No
AWF07	Not required	No	Yes	Yes	No
AWF08	Yes – 1/5 second, 5 nm	No	Yes	Yes	No
AWF09	Yes – 1/5 second, 5 nm	Yes	Yes	Yes	Yes
AWF10	Not required	No	Yes	Yes	No
AWF11	Yes – 1/5 second, 5 nm	Yes	Yes	Yes	No

10 MARINE TRAFFIC SURVEY DATA

10.1 Introduction

The EOWDC NRA, submitted as part of the Application in 2013, presented Marine Traffic Survey Data collected in 2009 and 2010, comprising both AIS and Radar data collected from an onshore receiver installed on the Girdle Ness Lighthouse. The survey data covered 56 days, exceeding the requirements of MGN 371 (the relevant guidance note at the time of the NRA, replaced by MGN 543 in 2016). The data covered the following seasonal periods:

- Survey 1: 24th March to 7th April 2009
- Survey 2: 21st September to 5th October 2009
- Survey 3: 9th to 23rd April 2010
- Survey 4: 1st to 15th November 2010

To assess the validity of the vessel traffic data used in the NRA, 28 days of new AIS data has been analysed over the following periods, chosen to account for seasonal variations, and such that downtime was minimal:

- 19th June to 2nd July 2016, Summer (14 days)
- 3rd to 16th Feb 2016, Winter (14 days)

The updated AIS data has been used to validate the original survey data, and provide updated information where necessary. It should be noted that the updated data is AIS only, whereas the original surveys comprised both AIS and Radar data.

10.2 Survey Data Overview

10.2.1 NRA Survey Data - 2009

The AIS tracks recorded during the 2009 surveys are presented in Figures 6 and 7, colour coded by vessel type.

Both 2009 surveys showed that the vast majority of traffic passed to the east and south of the Development Area. It is noted that vessels were recorded within the Development Area during both surveys.

Figure 6 - Survey 1 – AIS (2009)

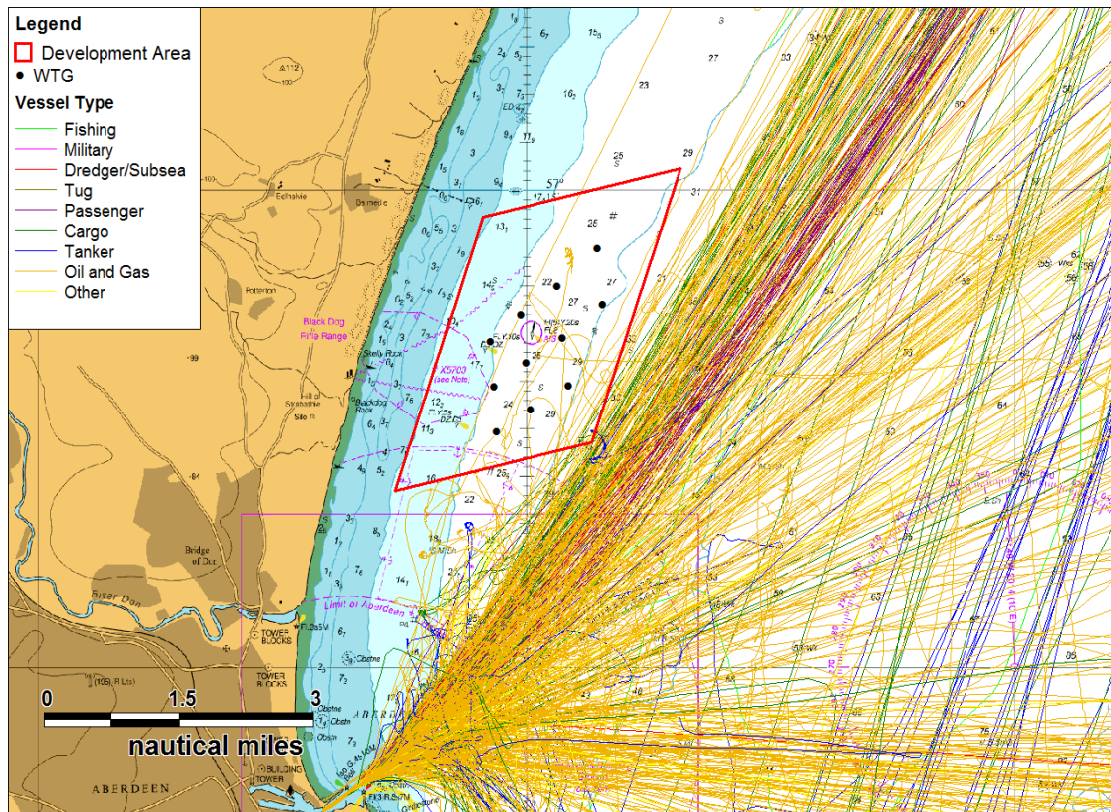
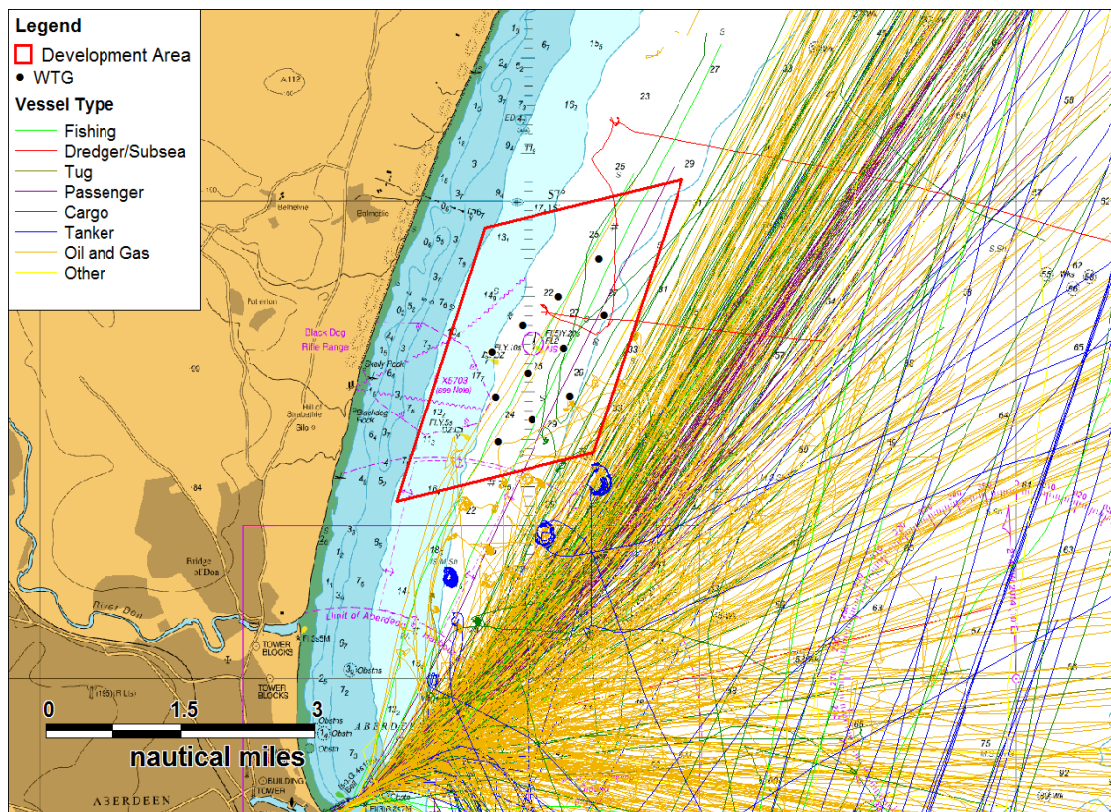


Figure 7 - Survey 2 – AIS (2009)



10.2.2 NRA Survey Data – 2010

The AIS tracks recorded during the 2010 NRA surveys are presented in Figures 8 and 9, colour coded by vessel type. Similarly to the 2009 surveys, the vast majority of traffic passed to the east or south of the Development, with a small number of vessels recorded within the Development itself.

Figure 8 - Survey 3 – AIS (2010)

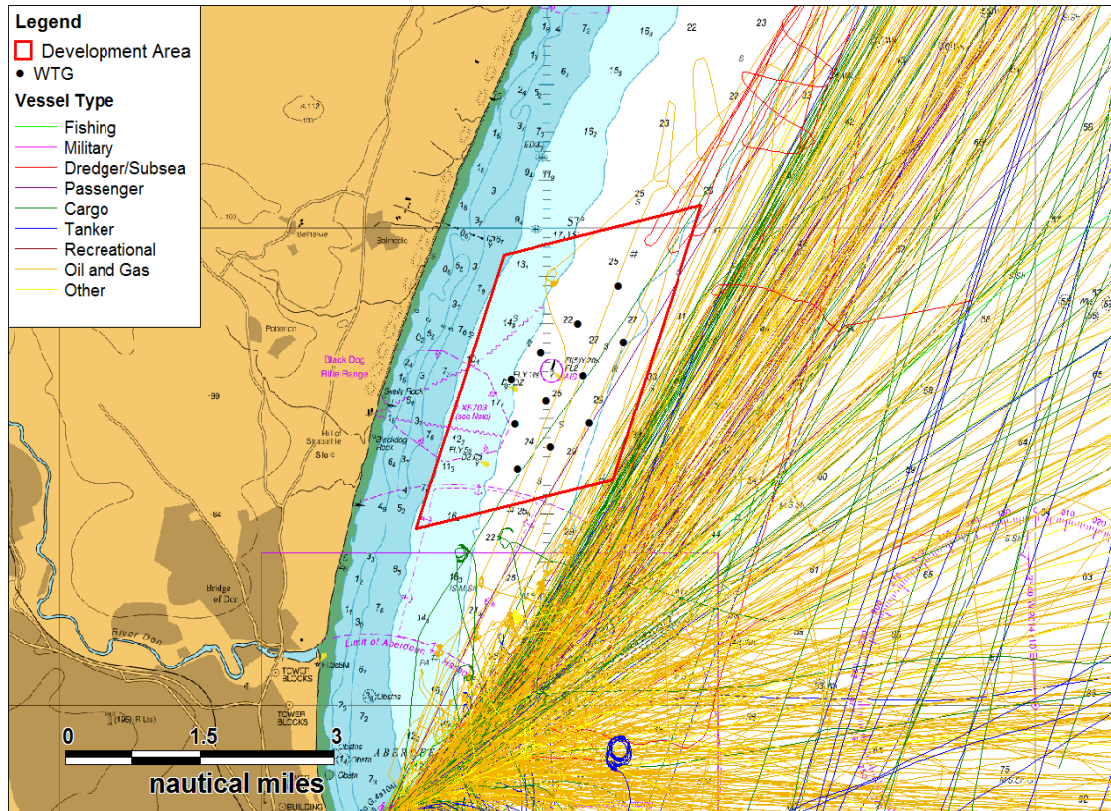
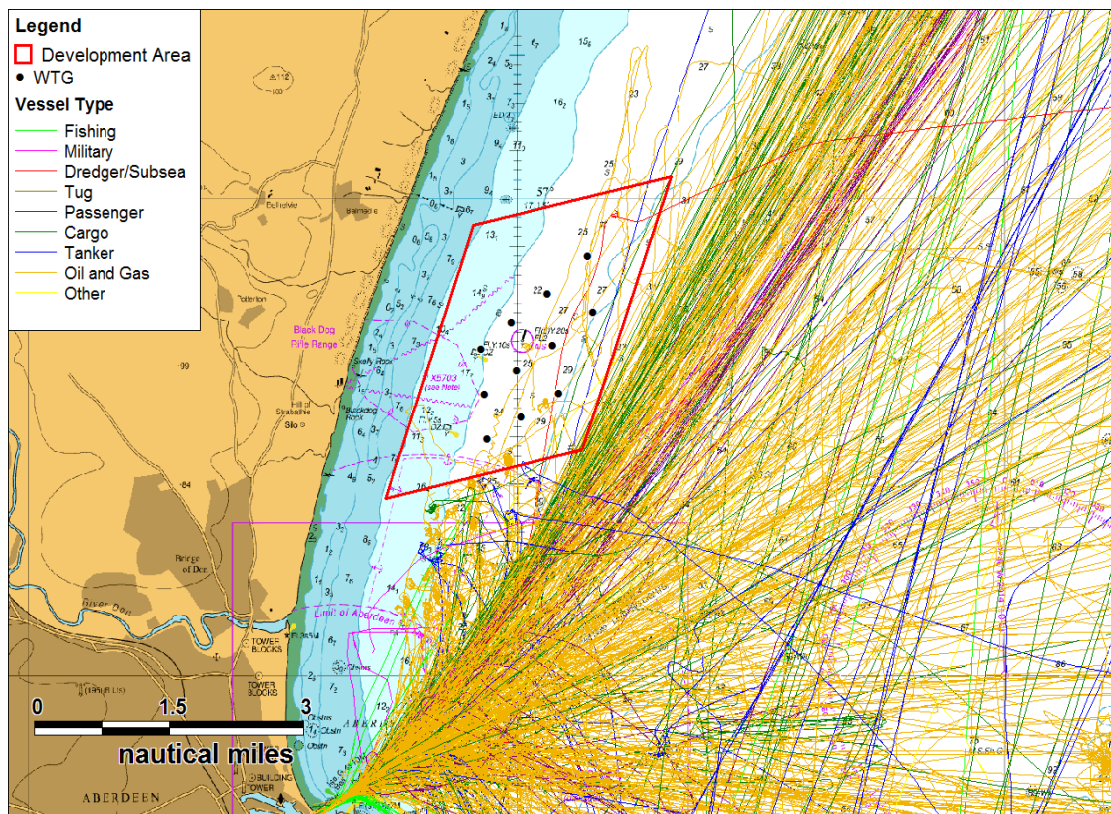


Figure 9 - Survey 4 – AIS (2010)



10.2.3 Survey Data – 2016

The AIS recorded during the 2016 summer and winter survey periods is presented in Figure 10 and 11 respectively, colour coded by vessel type.

Figure 10 - AIS Marine Traffic Survey Data – Summer 2016

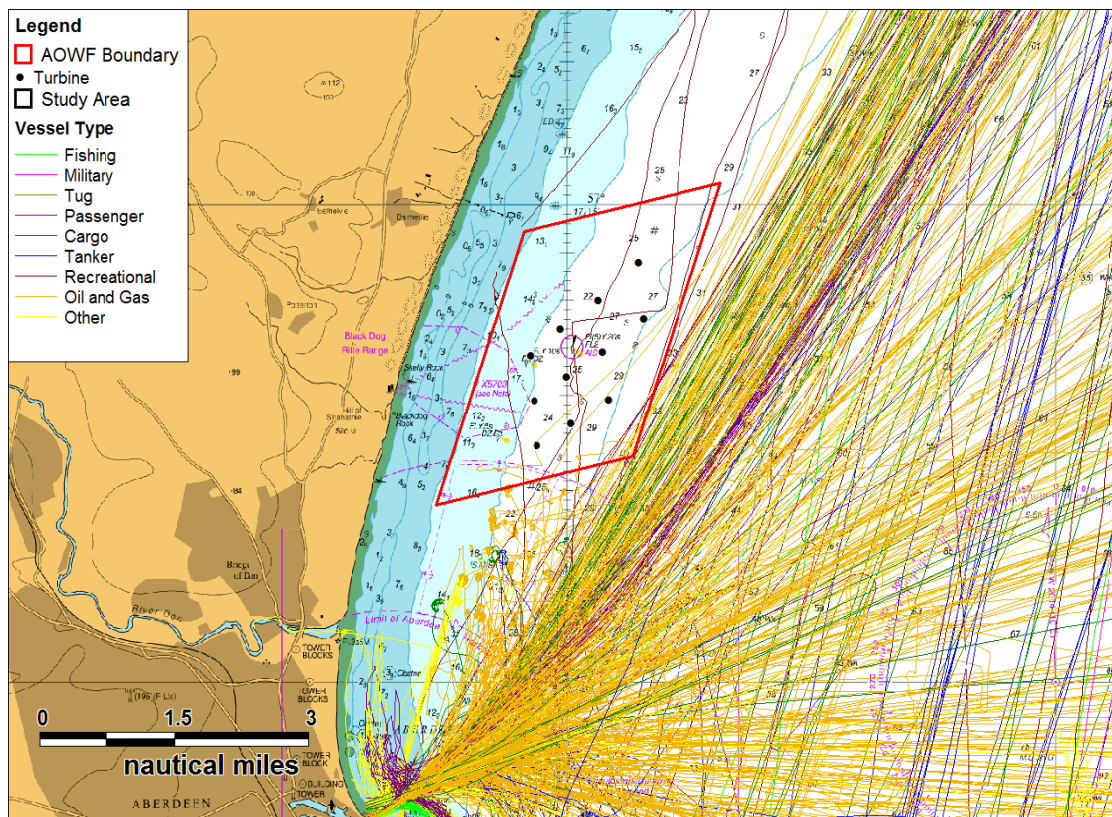
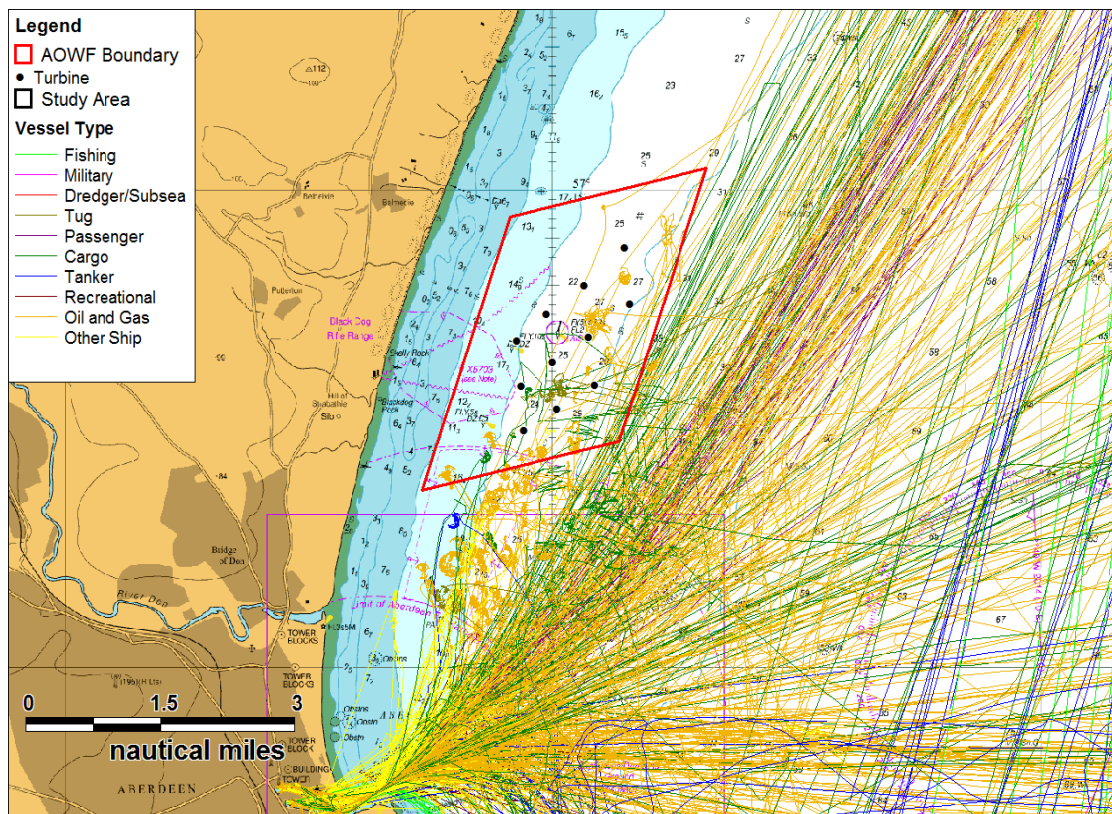


Figure 11 - AIS Marine Traffic Survey Data – Winter 2016



10.3 Data Validation

This section compares the original NRA data from 2009 and 2010 with the updated Marine Traffic Survey Data recorded in 2016 for validation purposes. It is noted that in line with the original surveys, pilot vessels and vessels berthed within Aberdeen have been excluded from the new data prior to the analysis.

For consistency, the analysis of all six surveys below has also only been undertaken on vessels recorded within 10 nm of the Development Area (note that the NRA analysis was based on all vessels within 20 nm of the Girdle Ness lighthouse survey base location).

10.3.1 Vessel Count

The average number of unique vessels per day recorded in each of the relevant surveys is presented in Table 10. Note that the analysis is based on AIS only (i.e., the Radar data from the NRA surveys has not been included).

Table 10 - Unique Vessels per Day - Average

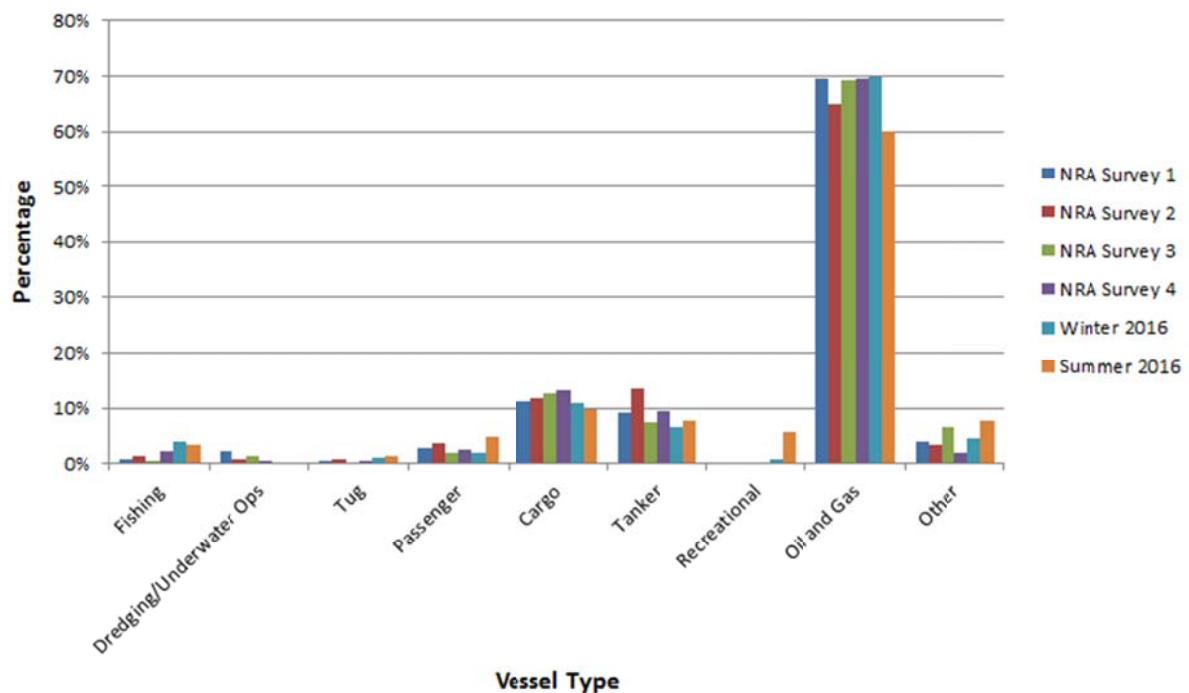
Data	Number of Unique Vessels	
2009 NRA	Survey 1	38
	Survey 2	40
2010 NRA	Survey 3	36
	Survey 4	43
2016 Validation	Summer	44
	Winter	49

It was observed that traffic levels were generally higher in the two sets of 2016 traffic survey data than in the prior NRA surveys (particularly in the 2016 winter survey). This seems to be largely related to an increase in anchoring activity outside of Aberdeen during the winter 2016 survey relative to the other surveys. The most likely explanation for this is the downturn in the oil and gas industry at the time leading to an increase of vessels waiting within the anchorage, however adverse weather may also have been a factor.

10.3.2 Vessel Type

The vessel type distributions recorded during the NRA marine traffic surveys (2009 and 2010) are compared with the distributions observed in the updated 2016 data in Figure 12.

Figure 12 - Marine Traffic Survey Vessel Type Distributions

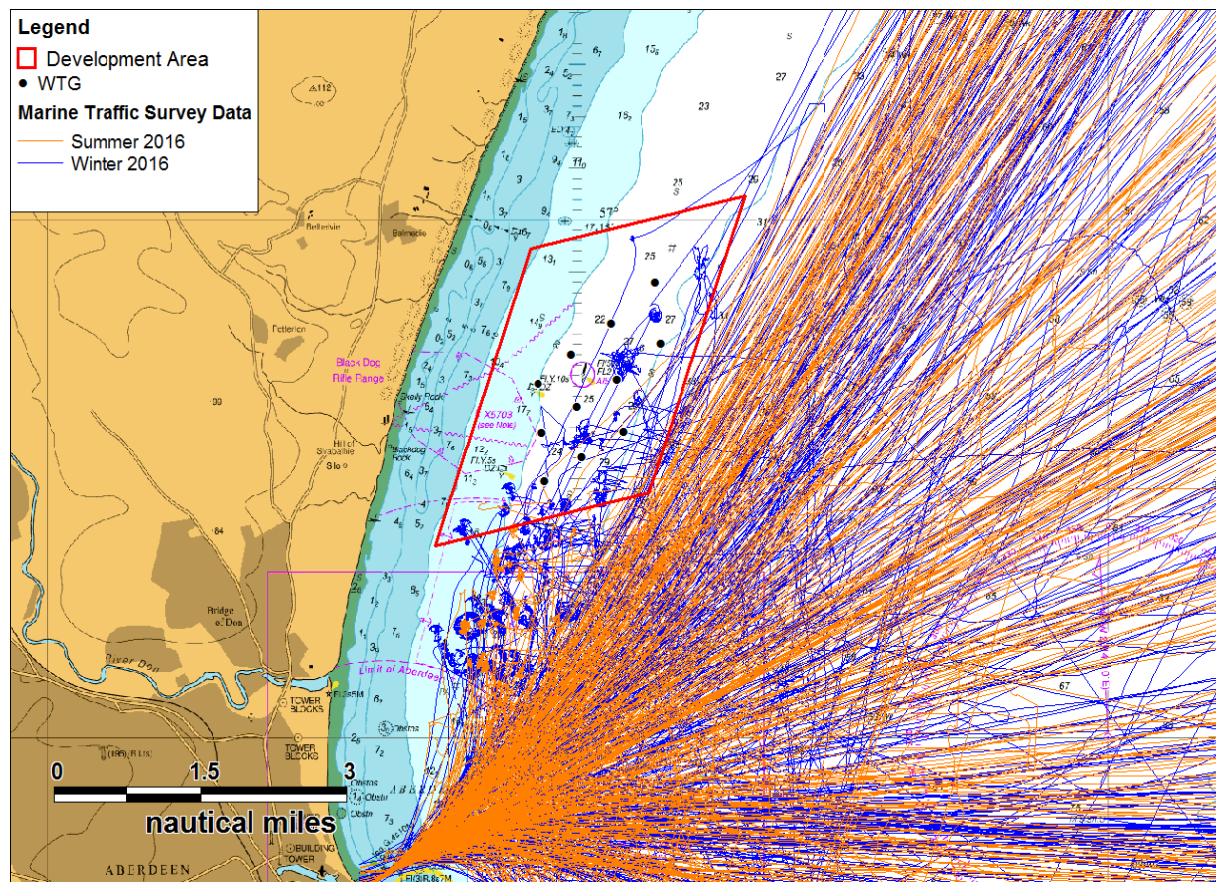


Overall, there was good correlation between the six data marine traffic survey data sets, with each showing vessels associated with the oil and gas industry to be the most common. All six data sets also showed a significant proportion of vessels were commercial (tanker and cargo). It is noted that higher percentages of recreational vessels, and to a lesser extent fishing vessels, were recorded during the 2016 surveys. This is likely to be due to an increased number of smaller vessels broadcasting via AIS in 2016 when compared to the original NRA surveys.

10.3.3 Oil and Gas Vessels

Figure 13 presents the AIS tracks recorded from vessels associated with the oil and gas industry, colour-coded by vessel sub-type.

Figure 13 - Oil and Gas Vessels recorded in 2016 Survey Data



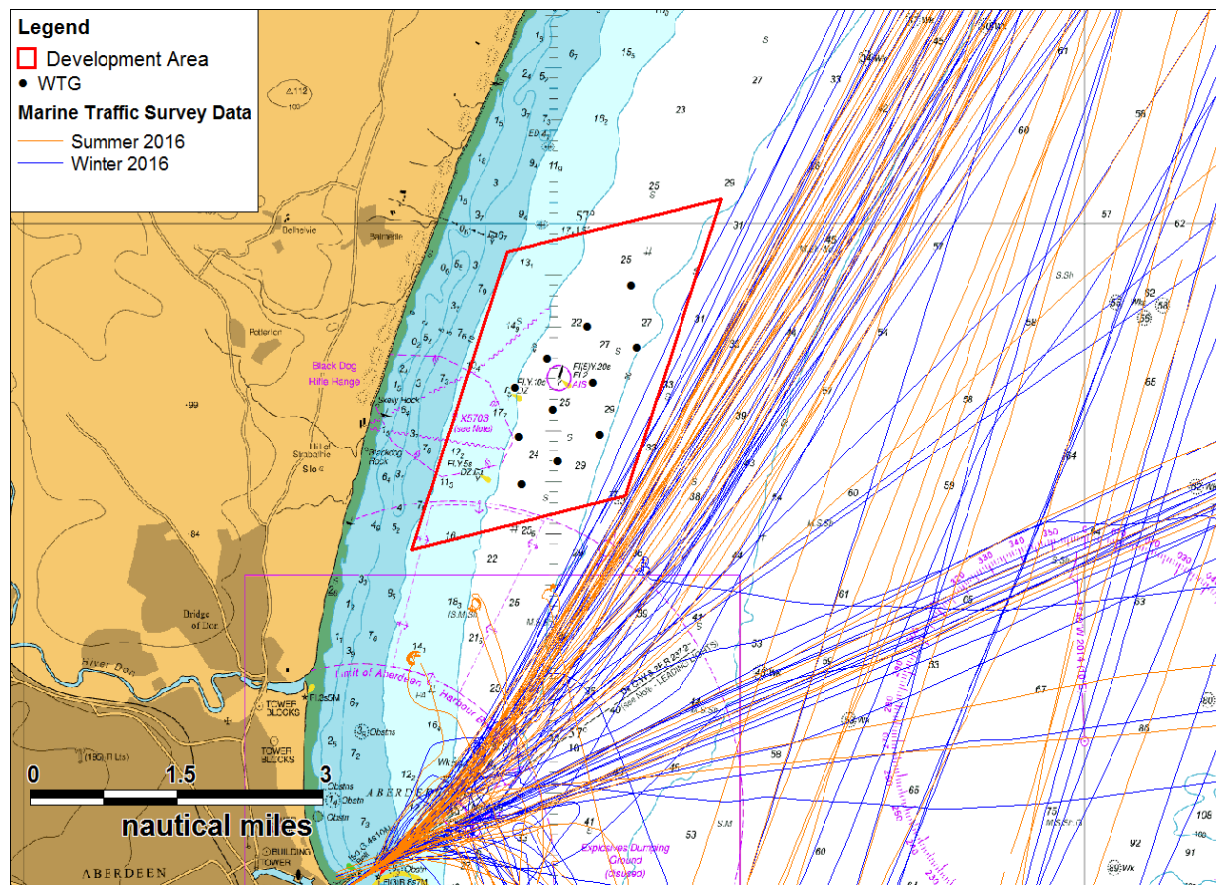
As observed in *Section 10.3.2*, the majority of vessel traffic in the vicinity of the Development Area during all the marine traffic surveys was associated with the oil and gas industry. Over the course of the two 2016 surveys, approximately 31 unique oil and gas vessels were recorded per day. This represented an increase over the NRA surveys, when 27 unique oil and gas vessels were recorded per day. The increase, as discussed in *Section 10.3.1*, is considered likely to be due to an increase in vessels anchoring outside of Aberdeen, which is assumed to be related to the downturn in the oil and gas industry, though adverse weather may also have played a part during the winter survey.

It is noted that anchoring activity from oil and gas vessels was recorded within the Development Area during the winter survey. Vessels were likely to be anchoring here in order to keep a safe distance from other anchored vessels. The designated anchorage area to the south of the Development Area was observed to be particularly busy during the 2016 winter survey period, for the reasons stated above. Similar anchoring activity within the Development Area (but to a much lesser extent) was observed in the NRA surveys.

10.3.4 Cargo Vessels

The AIS tracks from cargo vessels recorded during the 2016 survey periods are presented in Figure 14.

Figure 14 - Cargo Vessels recorded in 2016 Survey Data



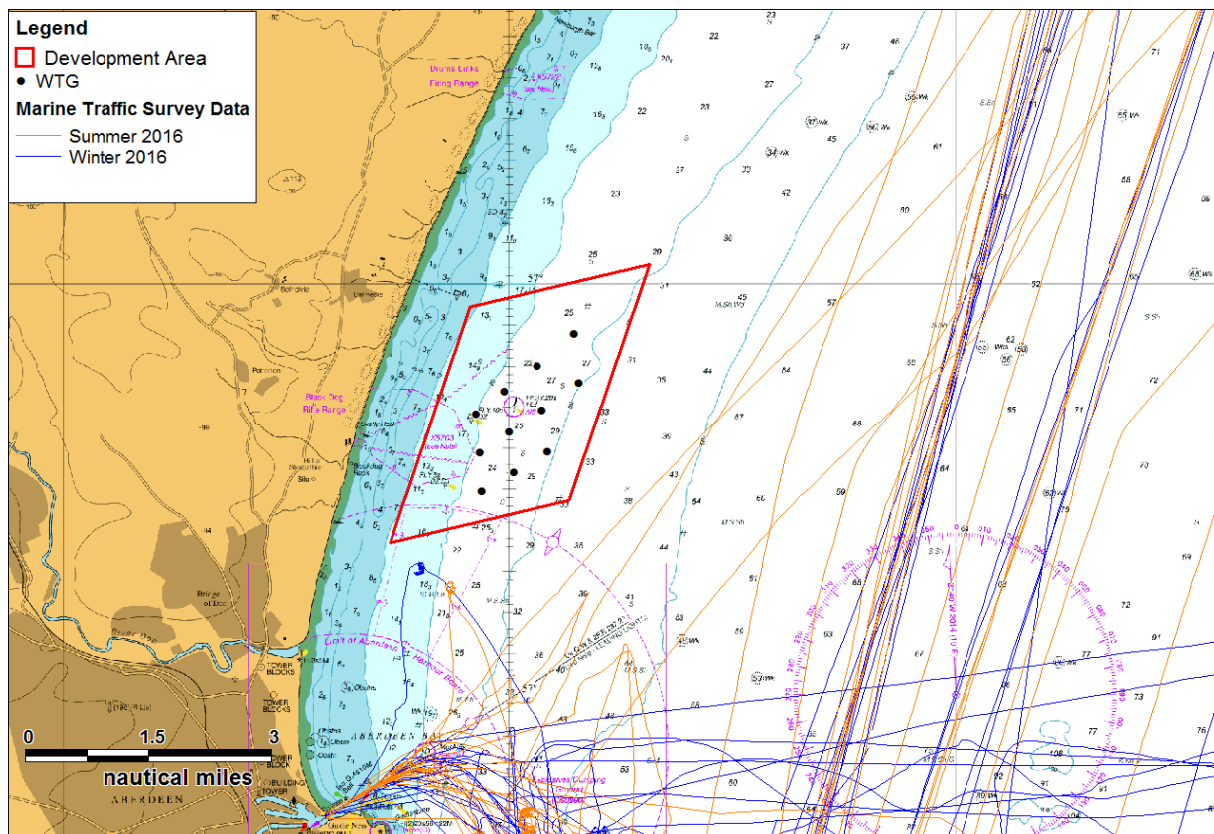
During the 2016 surveys, an average of approximately five unique cargo vessel tracks was recorded per day. This correlates well with the original NRA surveys, where five unique cargo vessels per day were also recorded across their combined duration. The vast majority of passing cargo vessels did so to the east of the Development Area, however four tracks (all recorded during the winter period) passed through the Development Area boundaries. The closest passing distance to the proposed location of the WTGs from a cargo vessel was approximately 400 m.

In the original NRA surveys (totalling 56 days), 15 cargo vessel tracks were recorded within the Development Area. It is considered likely that the 2016 anchoring activity north of the designated anchorage may have resulted in vessels passing further to the east of the Development Area than during the NRA survey periods, which may explain the decrease in cargo vessel activity within the Development boundary.

10.3.5 Tankers

The AIS tracks from tankers recorded during the 2016 survey periods are presented in Figure 15.

Figure 15 - Tankers recorded in 2016 Survey Data



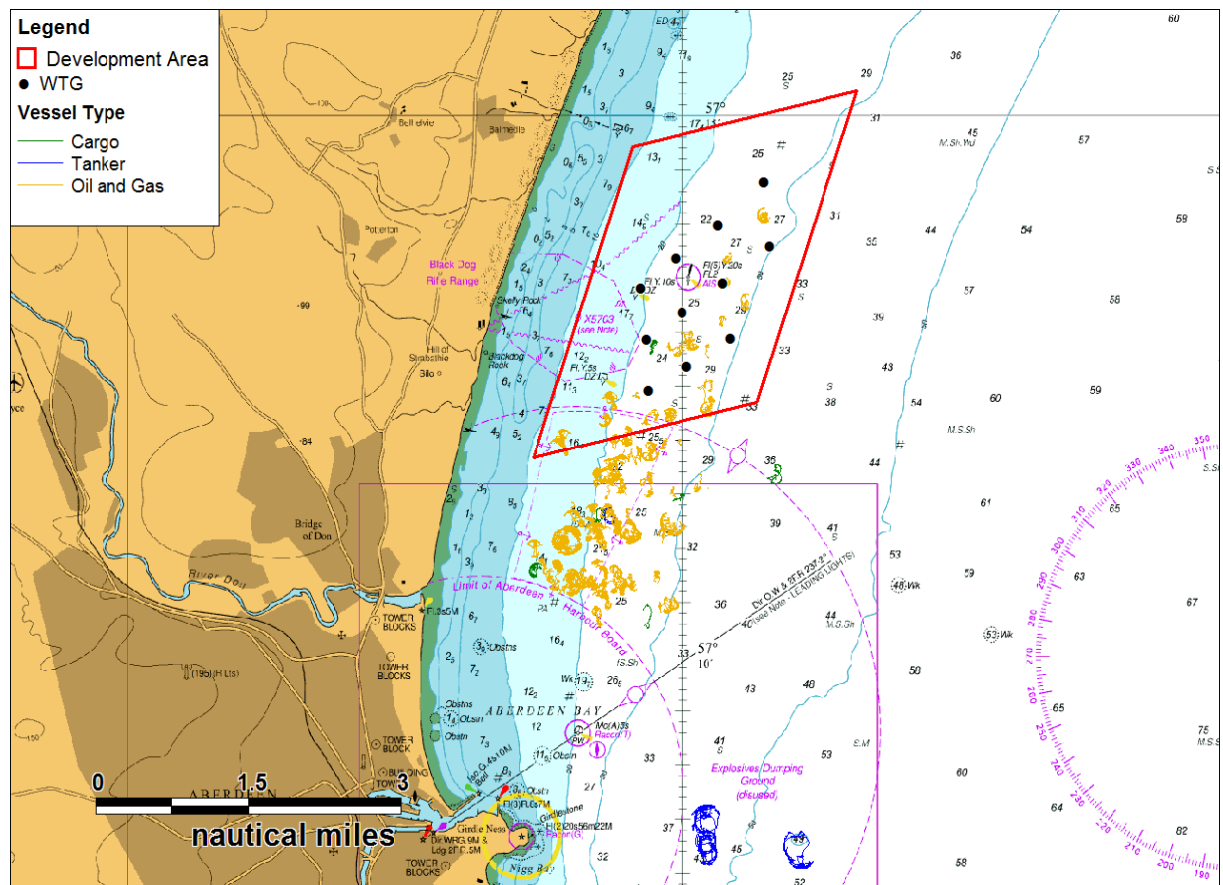
During the 2016 marine traffic surveys, approximately three unique tankers were recorded per day, which represents a minor decrease from the original NRA surveys, when four unique tankers were recorded per day (across the combined 56 day period).

No tankers were recorded within the Development Area during the 2016 surveys. In the original NRA surveys, three tracks from tankers were recorded within the Development Area; one on passage bound south for Immingham and two at anchor (though it is noted the anchored tankers only intersected the edge of the Development Area boundary).

10.3.6 Anchoring

The vessels at anchor in the vicinity of the Development Area are shown in Figure 16.

Figure 16 - Vessels anchored in the vicinity of the Development Area



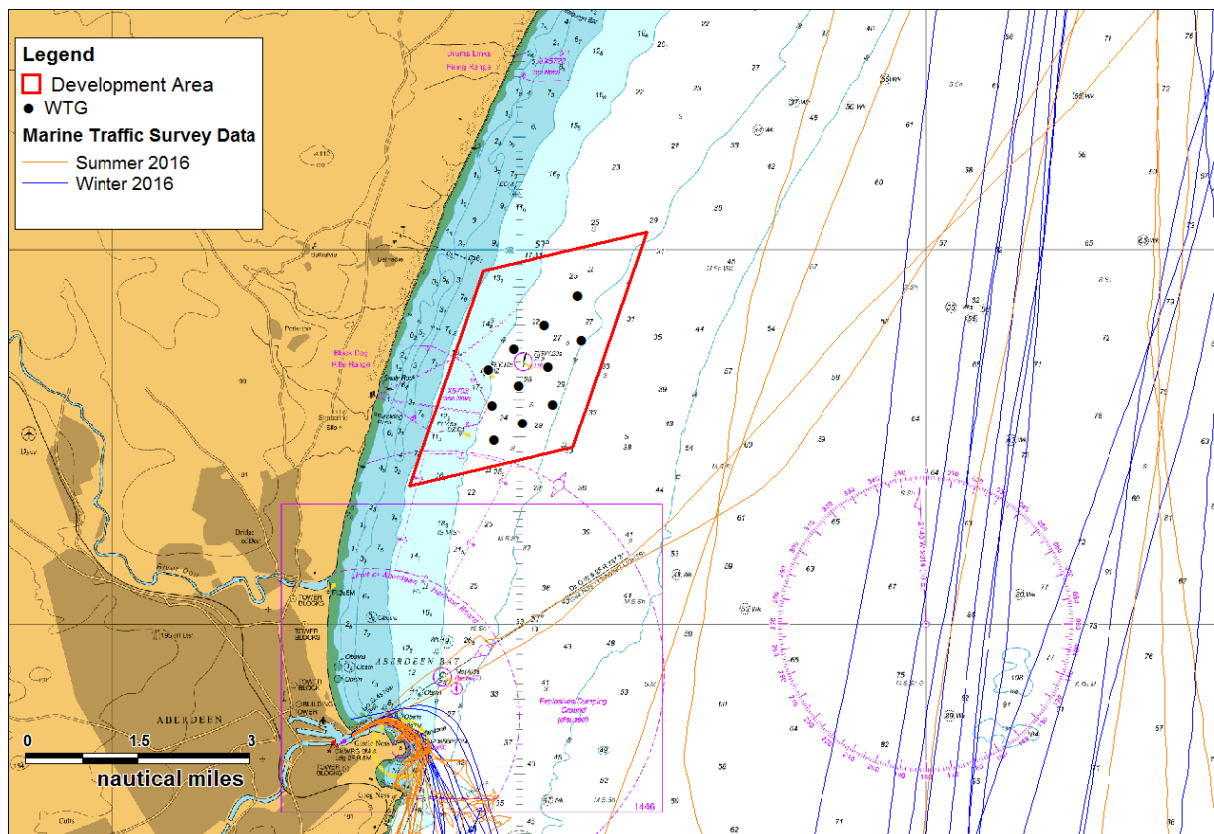
On average, approximately two vessels per day were at anchor within the Development Area in the combined 28 day 2016 survey period, compared to less than one per day in the NRA surveys. As discussed in *Section 10.3.1*, the higher levels of anchoring activity were assumed to be associated with the downturn in the oil and gas industry. Adverse weather may also have played a part.

It is noted that at the time of the surveys, there were no restrictions associated with anchoring in the Development Area.

10.3.7 Fishing

The fishing vessels recorded in the 2016 marine traffic surveys are presented in Figure 17.

Figure 17 - Fishing Vessels in the Vicinity of the Development



No fishing vessels were recorded within the Development Area during the 2016 survey periods. Fishing vessels passing the Development Area did so at least 1.5 nm to the east of the boundaries, and appeared to be on passage to, or from fishing grounds, rather than actively engaged in fishing.

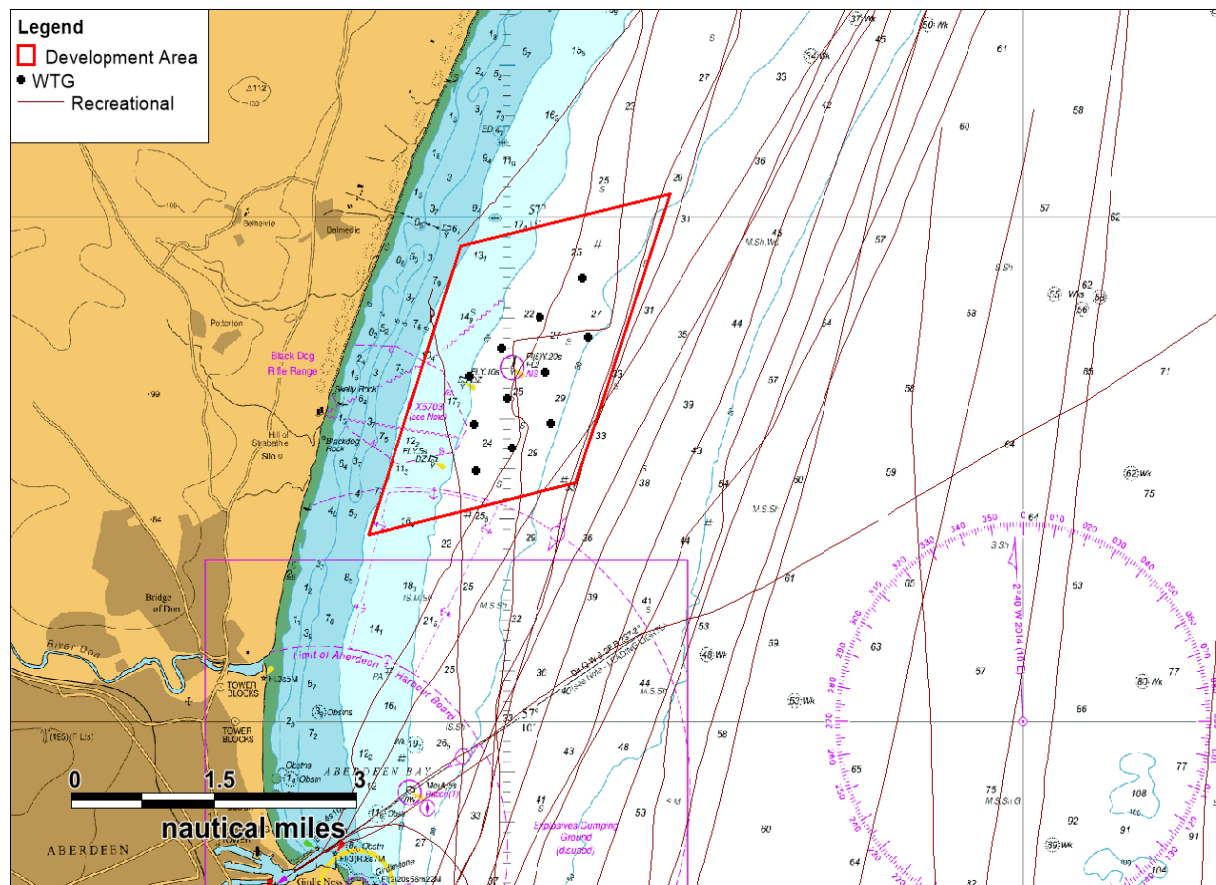
During the original NRA surveys, four fishing vessels were recorded within the Development Area. It should be noted that two of the four vessels were tracked via radar, rather than AIS, however neither would have been required to broadcast via AIS at the time based on their length. Had these vessels been present in the 2016 survey periods, they would have been required to carry and broadcast AIS based on the updated carriage requirements (as of the 31st May 2014, all fishing vessels of 15 m and above must broadcast).

It is likely that the increased anchoring presence in the vicinity of the Development Area during the 2016 survey periods resulted in fishing vessels passing further to the east, however annual variations in fishing activity may also be a factor in the observed change.

10.3.8 Recreational

The AIS tracks from recreational vessels recorded during the summer 2016 survey are presented in Figure 18. No recreational vessels were recorded during the winter 2016 survey. It should be noted that as AIS transmission is not a requirement for small recreational vessels, the below analysis is likely to under-represent the actual recreational activity.

Figure 18 - Recreational Vessels recorded in 2016 Survey Data



An average of approximately two unique recreational vessels per day was recorded in the summer 2016 traffic survey data. Over the course of the survey, five of these recreational vessels were recorded within the Development Area.

During the original NRA surveys, only ten recreational craft were recorded via radar, and visual observations (none were recorded on AIS). The most likely explanation for the difference in recreational activity is seasonal variation, with the 2016 survey data recorded in June and July, while the NRA surveys were undertaken in March, April, September, October and November. It should also be considered that while not a legal requirement for small recreational vessels, the use of voluntary AIS is becoming more common due to its valuable safety benefits to recreational users.

11 RISK ASSESSMENT REQUIRED FOR SAFETY ZONES

11.1 Introduction

The following subsections summarise the potential risks to shipping and navigation identified for the construction and operational 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 sought.

11.2 Reduction of Collision Risk

Throughout the construction of the Development, a number of construction vessels will be within the buoyed construction area carrying out the installation of foundations, WTGs and inter-array cables. This will involve the utilisation of a large variety of vessels including barges, tugs, jack-ups and HLVs. As shown in the VMP (ABE-ENV-BD-0006), each major construction phase is expected to involve one large installation vessel, which will be RAM. There will also be smaller vessels present at the Development throughout the construction phase in supporting roles.

During the operational phase of the Development, it is anticipated that instances where multiple vessels may be present on site will only be during periods of major maintenance. Major maintenance is defined as any activity involving large vessels, e.g. jack-ups, HLVs, etc., and notably vessels that are RAM. Similarly to the construction phase, it is anticipated that major maintenance will require one large vessel, supported by a number of smaller vessels.

As observed in the marine traffic survey data, the nearest notable shipping route to the Development passes to the east and is used mainly by oil and gas vessels (*Section 10.3.3*), and cargo vessels (*Section 10.3.4*). There is considered to be a low risk of collision between vessels using this route and construction/maintenance vessels working in the eastern extent of the Development.

Furthermore, the marine traffic surveys identified that vessels use the Development Area for anchoring purposes (*Section 10.3.6*), particularly when the designated anchorage to the south is busy compared to other anchorage areas around the coast, and there is therefore considered to be a low risk of collision between vessels seeking anchorage and construction/maintenance vessels within the Development Area.

Seasonal recreational (*Section 10.3.8*) and fishing vessel (*Section 10.3.7*) activity, which is more frequently diurnal, also pose a negligible collision risk to construction/maintenance vessels within the Development Area.

It is noted that the presence of construction/maintenance vessels and partially completed or pre-commissioned structures within the Development Area should encourage vessels to pass at a safe distance in most cases, however the deployment of 500 m safety zones (as identified by risk assessment) may provide an additional level of protection against a collision by ensuring that the area containing active construction (and RAM vessels) is clear and avoidance enforced. Any vessel approaching or infringing the safety zones will be alerted using the standard marine procedures, as set out in *Section 13*.

11.3 Reduction of Allision Risk

While construction is ongoing, the partially constructed and pre-commissioned WTG structures pose an allision risk to passing traffic, particularly during the early phases of the Development when vessels may not be fully aware of construction activities, or be familiar with the Development. The presence of construction/guard vessels is likely to dissuade passing vessels from approaching the Development to some extent, however mandatory safety zones around active construction will make it clear that a safe distance should be kept from the structures at all times.

Once the WTGs are complete and following risk assessment of ALARP parameters, the potential inclusion of 50 m safety zones around each completed structure, prior to full commissioning, will reinforce the need for passing vessels to maintain a safe distance from the structures at all times, particularly prior to the commissioning of the operational lighting and marking.

As details of all safety zones will be promulgated to stakeholders, they will also serve the purpose of increasing vessel awareness of the presence and location of the Development, thus decreasing the potential of an allision.

Safety zones will be monitored as set out in *Section 13*. Any vessel approaching or infringing the safety zones will be alerted using the standard marine procedures, thus reducing the allision risk.

11.4 Reduction in Risk of Interaction with Anchor Spread

During certain stages of the construction phase of the Development, construction vessels will be anchored to the seabed by a spread of anchors (this will be required during the installation of the WTG foundations), which may extend upwards of 1 km from the vessel (note that the anchor spread may not be within the 500m (maximum permissible) safety zones and vessels will be required to standard marine safety precautions against any interactions. Vessels involved in major maintenance may also require similar anchoring spreads during the operational phase. There is the potential for passing traffic to interact with the anchors and associated chains, which may have severe consequences for both the passing traffic and the AOWFL vessels.

The implementation of 500 m safety zones around the foundation/WTG locations ensures that passing traffic avoids the areas where the risk of anchor chain interaction is high (noting the maximum 500 m extent of safety zones). The need for safety zones will be risk assessed on a case by case basis to identify if they are required to protect the activity. In addition to safety zones, appropriate promulgation of information regarding construction/maintenance activities and any associated anchor spreads will be undertaken to account for any relevant obstructions/hazards associated with the Development.

11.5 Protecting AOWFL Personnel

Throughout the construction phase, and during periods of major maintenance in the operational phase, there will be a significant number of AOWFL personnel within the Development Area and surroundings. Due to the potential for collision and allision risk from

passing traffic (see *Sections 11.2 and 11.3*) there is the low level and infrequent risk of loss of life or injury to both AOWFL personnel, and the crews of the passing vessels.

The presence of safety zones, as risk assessed for active construction activities, will ensure that passing traffic is kept a safe distance from all vessels associated with AOWFL. The promulgation of information regarding the safety zones will also provide an alert to passing traffic, and allow advanced passing planning to reduce the collision risk, and ensure the safety of all crews/personnel (to within ALARP parameters).

11.6 Reduction in Fishing Gear Snagging Risk

The presence of anchor chains (see *Section 11.4*) and WTG structures within the Development pose a snagging risk to fishing vessels with gear engaged. As observed in the marine traffic survey data (see *Section 10.3.7*), no fishing vessels were recorded in, or near the Development during the 2016 survey periods. However, due to the seasonal nature of fishing, this should not be taken to mean that fishing vessels will not enter the Development in the future.

Should a fishing vessel snag its gear, there is the risk of damage to AOWFL assets, damage to (or loss of) the fishing gear, or as a worst case, the capsizing of the fishing vessel, which may lead to loss of life.

The implementation of safety zones (as an addition to other mitigation, such as the use of guard vessels) may reduce the likelihood that a fishing vessel will snag its gear. As per *Section 13*, any fishing vessel approaching areas of construction will be contacted by the guard vessel (or other designated vessel /MC), identifying the area of danger and thus reducing the risk that the vessel will go on to snag its gear. If required safety zones can be deployed as an additional mitigation.

11.7 Accounting for Inexperienced Mariners

As shown in *Section 10.3.8*, a number of recreational vessels were recorded within the Development Area. It should be considered that recreational users may not be experienced mariners, and hold few formal marine qualifications. Furthermore, there is no requirement for recreational vessels to carry as high a standard of navigational equipment as that expected of a commercial vessel.

Therefore, there is potentially a need to mitigate against marine inexperience and equipment should risk assessments identify. Safety zones in addition to other appropriate mitigations may be considered necessary by the onsite risk assessment process. It should be noted that inexperienced mariners may not be equipped to accurately judge their distance from a safety zone, however, assuming effective promulgation of information to the relevant recreational stakeholders, awareness of the presence of the safety zone should ensure that recreational users are cautious and keep their distance.

As per *Section 13*, any recreational vessel approaching or infringing the safety zones will be informed as such by the guard vessel (or other designated vessel/MC).

11.8 Accounting for Unforeseen Circumstances

Throughout the construction phase, and during periods of major maintenance of the Development, there is potential for a number of events to occur which may result in previously unforeseen risk to Mariners (for example structural issues with a wind farm component) in this circumstance safety zones may act to help mitigate that risk in conjunction with other agreed mitigations. Any such deployment will be risk assessed and in line with the agreed safety zones listed in *Section 1.2*.

12 POTENTIAL CONSTRUCTION / SAFETY ZONE IMPACTS

12.1 Impacts on Passing Traffic

As the vast majority of traffic passing the Development Area already passes a safe distance to the east, it is unlikely that the presence of 500 m safety zones will have a significant impact on the current regular routed traffic. Assuming effective promulgation of information, vessels should be able to plan their passage without any significant route deviations associated with the safety zones, as there are no significant navigational sea-room restrictions to the east. It is also noted that the cardinal buoys in place during the construction phase (see *Section 9.2*) will indicate to passing traffic that the buoyed construction area should be avoided.

Similarly, if 50 m pre-commissioning safety zones around each WTG are established, no significant impacts on passing traffic are anticipated.

Guard vessels, the MC and other designated vessels will be provided information (via this application and other relevant AOWFL documentation, in addition to NtMs) on known routes and users in the area.

12.2 Impacts on Anchored Vessels

As observed in *Section 10.3.6*, vessels (not associated with AOWFL) are known to anchor within the Development Area. However, as the cardinal buoys are in place throughout the construction phase (see *Section 9.2*), and the buoyed construction area should be avoided by non AOWFL vessels, there will be no additional impact to anchoring in the Development Area from the rolling safety zones.

12.3 Impacts on Fishing Vessels

Fishing activity (both mobile and static) within, and near the Development Area is considered to be low (see *Section 10.3.7*) compared to other areas of the UK. During consultation, and as summarised in the ES, the Development Area is considered to constitute of only a small proportion of the fishing grounds for local vessels identified as operating within the general area, and the presence of safety zones is therefore not anticipated to cause a significant impact to fishing productivity. Furthermore, construction of the Development is proposed to be carried out in a single phase, with the majority of works currently planned to be undertaken during winter months, when any fishing activity is limited.

It is also noted that there are salmon netting stations located to the west of the development area and the maximum extent of the proposed safety zones. These have not been fished. If the netting is recommenced, it is not anticipated that the safety zones would impact upon their operation.

Fishing vessels on passage to port, or other fishing grounds (rather than engaged in active fishing) are considered to have ample sea room to the east to avoid the safety zones.

AOWFL has a Fishing Mitigation Strategy in place and a fishing liaison officer has been appointed to liaise with the local fisheries community.

12.4 Impacts on Recreational Vessels

Recreational activity is considered to be generally low in the vicinity of the Development Area, however a number of recreational vessels were recorded within its boundaries during the marine traffic surveys (see *Section 10.3.8*). As the cardinal buoys are in place throughout the construction phase (see *Section 9.2*), and the cardinal buoys indicate that a non AOWFL vessels should pass clear, there should be no additional impact from the safety zones. Should inexperienced recreational mariners (see *Section 11.7*) pass inside of the buoys and approach the safety zones, the guard vessel (or nominated AOWFL vessel/MC) will make contact as soon as possible to inform the infringing vessel (as per *Section 13*) using standard marine terminology.

12.5 Impact on the Blackdog Firing Range

The Blackdog Firing Range lies to the west of the Development Area and to the north of the OECs. Full details of operational procedures to be followed by AOWFL vessels relative to the Firing Range are given in the Black Dog Firing Range Management Plan (ABE-ENV-DB-0013). There is no anticipated impact to firing range activities arising from the safety zones, assuming AOWFL vessels follow the procedures agreed in the Firing Range Management Plan.

It is also noted that there are no restrictions on third party vessel movements within the Blackdog Firing range. Relevant UKHO Admiralty Charts (for example, Admiralty Chart No 210) state of the Firing Range that *"No restrictions are placed on the right to transit the firing practice areas at any time. The firing practice areas are operated under a clear range procedure: exercises and firing only take place when the areas are considered clear of all shipping."* There is therefore anticipated to be minimal impact on third party vessels if the firing range and safety zones are considered cumulatively, as any vessel can safely transit the area by passing inshore of the safety zones though the firing range (an option likely to be only used by smaller vessels e.g., fishing, recreation).

13 PROMULGATION, MONITORING AND POLICING

13.1 Promulgation of Information

The deployment of a safety zone will be promulgated as per the process set up within the NSP (ABE-ENV-QB-0008) including but not limited to Notice to Mariners, Radio Warnings and Kingfisher – Offshore and Marine Renewables (KIS-ORCA) bulletins.

The presence of a safety zone will also be identifiable by the presence of a RAM construction or maintenance vessel and a guard vessel (or other nominated vessel) on site at a WTG location.

13.2 Monitoring

During the construction phase, the MC will monitor the safety zones through AIS and liaise with the vessels working at the Development. Given the size and number of WTGs, the vessels on site will be able to visually monitor the site having access to on board communication and radar systems including during low visibility to alert the construction teams to the presence of a third party. A guard vessel has been employed to be present during certain stages of the construction phase. During these stages the guard vessel will be responsible for monitoring the safety zones using its own Radar, AIS, VHF communications, and visual observations (noted that monitoring from the MC will be AIS only). During stages when a guard vessel is not present, another designated vessel or the MC will be responsible for ensuring that another suitable vessel on site undertakes the monitoring responsibilities.

Where possible, early contact will be made with a vessel to advise it against entering a safety zone. A vessel observed to enter into a safety zone will be contacted by the guard vessel (or nominated vessel /MC if a guard vessel is not present) using standard marine procedures, and informed that they have or are close to infringing the safety zone. The vessel will be instructed to increase their passing distance from the safety zone and to avoid from entering in the future.

It is noted that direct navigational advice shall not be given to any vessel. Standard marine terminology will be used to warn the vessel that action to avoid the safety zone (or a RAM vessel) will be required.

13.3 Policing

Where feasible, details of any vessels which consistently ignore the warnings issued by AOWFL 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 the International Regulations for the Prevention of Collisions at Sea 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.

14 SUMMARY

This document provides the necessary information to support an application for the following safety zones:

- During the construction phase a programme of 500 m 'rolling' safety zones around the location of each wind turbine and/or its substructures and foundations during construction activities
- Pre-commissioning 50 m safety zones surrounding each wind turbine and/or its substructures and foundations whilst construction work is not ongoing.
- During the operational phase, a 500 m safety zone around all 'major maintenance' being undertaken on any wind turbine and/or its substructures

Each stage of construction of the Development requires a large installation vessel (which will be RAM), with multiple smaller supporting vessels also present when required. Similar vessel activity is also likely to be required during periods of major maintenance during the operational phase.

During the construction and operational phases, the Development will be marked and charted, as required by the NLB.

Up to date marine traffic survey data recorded in 2016 correlated well with the AIS analysed in the NRA. This data showed that any impacts to passing traffic from safety zones would be minor.

The safety zones will help to:

- Further reduce the likelihood of a collision incident by ensuring hazard construction areas containing RAMs vessels are effectively marked (by the safety zone) and promulgated;
- Further reduce the likelihood of an allision incident;
- Further reduce the likelihood of interaction between passing traffic and AOWFL anchor spreads;
- Provide additional protection tot AOWFL personnel and the crews of passing traffic during certain activities;
- Further reduce the likelihood of a fishing vessel snagging its gear during certain activities;
- Provide additional protection to inexperienced mariners or navigational equipment allowing accurate position fixing; and
- Account for unforeseen circumstances.

The safety zones, when in force, shall be effectively promulgated and monitored for infringements by third party vessels by a dedicated onsite guard vessel (or another nominated vessel). The primary response will be to alert infringing vessels to their infringement by VHF radio. If deemed appropriate the onsite guard vessel may intercept the infringing vessel continually ensuring compliance with the International Convention for the Prevention of Collisions at Sea. Records of all infringements shall be kept (via vessel logs,

photos or AIS recording) and evidence passed to Marine Scotland for follow-up action, if necessary.

15 REFERENCES

Anatec Ltd (2011). *Navigation Risk Assessment for the European Offshore Wind Deployment Centre*. Aberdeen. June 2011.

Maritime and Coastguard Agency (MCA) (2016), *Marine Guidance Note (MGN) 543: Offshore renewable energy installations (OREIs): guidance on UK navigational practice, safety and emergency response*. Available online:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/502021/MGN_543.pdf [accessed 19/09/16].