EDF RENEWABLES

Neart na Gaoithe Offshore Wind Farm

Safety Zone Application

Revision 2.0

January 2020

DOCUMENT REFERENCE: NNG-ANA-ECF-REP-0004

Neart na Gaoithe Offshore Wind Farm

Safety Zone Application

Document Control

SIGN OFF		
Name (Role)	Signature	Date
David Sweenie Development Manager	[Redacted]	17/01/2020
Mick Hoyle Construction Manager	[Redacted]	17/01/2020
Claire Gilchrist Offshore Consenting	[Redacted]	13/01/2020

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Acronyms and Abbreviations

ACRONYM	DEFINITION
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As low as reasonably possible
BEIS	Department for Business, Energy & Industrial Strategy
CLV	Cable Lay Vessel
COLREGs	International Regulations for the Prevention of Collisions at Sea
DSLP	Development Specification and Layout Plan
FLO	Fisheries Liaison Officer
HLV	Heavy Lift Vessel
IMO	International Maritime Organization
JUV	Jack-up Vessel
kV	Kilovolt
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan
m	Metre
MW	Megawatt
NLB	Northern Lighthouse Board
nm	Nautical Mile
NnG	Neart na Gaoithe
NnGOWL	Neart na Gaoithe Offshore Wind Limited
NRA	Navigational Risk Assessment
OfTW	Offshore Transmission Works
OSP	Offshore Substation Platform
PLGR	Pre-lay Grapnel Run

RAM	Restricted in Ability to Manoeuvre
s	Second
SOLAS	Safety of Life at Sea
SOP	Standard Operating Procedures
SOV	Service Operation Vessel
SPS	Significant Peripheral Structure
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency

Defined Terms

TERM	DESCRIPTION
Addendum	The Addendum of Additional Information submitted to the Scottish Ministers by NnGOWL on 26 July 2018.
Application	The Environmental Impact Assessment Report, Habitats Regulations Appraisal Report and supporting documents submitted to the Scottish Ministers by NnGOWL on 16 March 2018; the Addendum of Additional Information submitted to the Scottish Ministers by NnGOWL on 26 July 2018 and the Section 36 Consent Variation Report dated 08 January 2019.
Company	Neart na Gaoithe Offshore Wind Limited (NnGOWL) (Company Number SC356223).
Consent Conditions	The terms that are imposed on the Company under the Offshore Consents that must be complied with.
Consent Plans	The plans, programmes or strategies required to be approved by the Scottish Ministers (in consultation with appropriate stakeholders) in order to discharge the Consent Conditions.
Contractors	Any Contractor/Supplier (individual or firm) working on the Project, hired by NnGOWL.
EIA Report	The Environmental Impact Assessment Report, dated March 2018, submitted to the Scottish Ministers by NnGOWL as part of the Application.
Inter-array Cables	The offshore cables connecting the wind turbines to one another and to the OSPs.
Interconnector Cables	The offshore cables connecting the OSPs to one another.
Marine Licences	The written consents granted by the Scottish Ministers under the Marine (Scotland) Act 2010, for construction works and deposits of substances or objects in the Scottish Marine Area in relation to

TERM	DESCRIPTION
	the Wind Farm (Licence Number 06677/19/0) and the OfTW (Licence Number 06678/19/1), dated 4 June 2019 and 5 June 2019 respectively.
Offshore Consents	The Section 36 Consent and the Marine Licences.
Offshore Export Cable Corridor	The area within which the offshore export cables are to be located.
Offshore Export Cables	The offshore export cables connecting the OSPs to the landfall site.
OfTW	The Offshore Transmission Works comprising the OSPs, offshore interconnector cables and offshore export cables required to connect the Wind Farm to the Onshore Transmission Works at the landfall.
OfTW Area	The area outlined in red and blue in Figure 1 attached to Part 4 of the OfTW Marine Licence.
Project	The Wind Farm and the OfTW.
Section 36 Consent	The written consent granted on 3 December 2018 by the Scottish Ministers under Section 36 of The Electricity Act 1989 to construct and operate the Wind Farm, as varied by the Scottish Ministers under section 36C of the Electricity Act 1989 on 4 June 2019.
Section 36 Consent Variation Report	The Section 36 Consent Variation Report submitted to the Scottish Ministers by NnGOWL as part of the Application as defined above on 08 January 2019.
Subcontractors	Any Contractor/Supplier (individual or firm) providing services to the Project, hired by the Contractors (not NnGOWL).
Wind Farm	The offshore array as assessed in the Application including wind turbines, their foundations and inter-array cabling.
Wind Farm Area	The area outlined in black in Figure 1 attached to the Section 36 Consent Annex 1, and the area outlined in red in Figure 1 attached to Part 4 of the Wind Farm Marine Licence.

Consent Plans relevant to the Safety Zone Application

CONSENT PLAN	ABBREVIATION	DOCUMENT REFERENCE NUMBER
Development Specification and Layout Plan	DSLP	NNG-NNG-ECF-PLN-0003
Navigational Safety Plan and Vessel Management Plan	NSVMP	NNG-NNG-ECF-PLN-0010
Lighting and Marking Plan	LMP	NNG-NNG-ECF-PLN-0009

1 Introduction

1.1 Background

1. The Neart na Gaoithe (NnG) Offshore Wind Farm (Revised Design) received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 03 December 2018 (the S36 Consent) and was granted two Marine Licences by the Scottish Ministers, for the Wind Farm and the associated Offshore Transmission Works (OfTW), on 03 December 2018 (the Marine Licences) (reference: [06677/18/0]/[06678/18/0]). The S36 Consent and associated Marine Licences are collectively referred to as 'the Offshore Consents'.
2. The Project is being developed by Neart na Gaoithe Offshore Wind Limited (NnGOWL).

1.2 Objectives of this Document

3. 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 (Electricity Regulations, 2007) respectively, a Safety Zone Application can be made to Marine Scotland requesting the formal implementation of safety zones around wind farm structures associated with the Project.
4. This document presents NnGOWL's safety case for the implementation of safety zones and represents the primary supporting document of the application for safety zones to Marine Scotland. The proposed safety zones are designed to manage potential interactions between third party vessels and the construction and maintenance activities undertaken as part of the Project, with a view to securing the safety of vessels and crews (both those associated with the Project and those deemed as third party), and to protect the wind farm structures.

1.2.1 Construction Phase

5. The following safety zones are applied for during the construction phase:
   - Mandatory "rolling" 500 metres (m) safety zones established around each wind farm structure (turbines and Offshore Substation Platforms (OSP)) and/or their foundations whilst construction works are in progress, as indicated by the presence of a construction vessel. The safety zones will be triggered whenever a vessel is on station at a structure and undertaking construction activities. Up to ten of these safety zones may be active at any given time.
   - Mandatory pre commissioning 50 m safety zones established around each wind farm structure (turbines and OSPs) and/or their foundations when construction works have been completed but prior to wind farm commissioning or where construction works have only been partially completed. These safety zones will be active at any structure during the construction phase where a construction vessel is not present. Up to 56 of the 50 m safety zones will be active at any given time, given that the Project will comprise of 54 turbines and two OSPs.

1.2.2 Operations and Maintenance Phase

6. The following safety zones are applied for during the operations and maintenance phase:
   - Mandatory 500 m safety zones around all "major maintenance" work being undertaken, where major maintenance is as per the definition given in the Electricity Regulations 2007 (see Section 6). The safety zones will be active whenever a "major maintenance" vessel is on station at a structure during the operational phase. Up to five of these safety zones may be active at any given time.

7. No permanent operational safety zones will be applied for.

1.2.3 Decommissioning

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

2 Compliance with Relevant Legislation

9. Schedule 16 of the Energy Act 2004 requires specific information to be 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 document.

10. Table 2-2 then summarises where, and how the relevant requirements from the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007, have been addressed within this document.

11. It is noted that Marine Scotland has responsibility for all applications received after 1st April 2017 (powers transferred from the Department for Business, Energy & Industrial Strategy (BEIS) under Section 62 of the Scotland Act 2016), and therefore their own Standard Operating Procedures (SOP) (MS-LOT, 2018) have also been considered (which are based on the Electricity Regulations 2007).

Table 2-1: Energy Act 2004 Schedule 16 Applications and proposals for notices under section 95

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.	Figure 3-2 and Figure 3-3 provide the location of the Wind Farm Area and associated installations on United Kingdom Hydrographic Office (UKHO) Admiralty Charts.
	(b) The waters in relation to which any declaration applied for will establish a safety zone.	Figure 3-2 and Figure 3-3 provide details relating to the waters within and in proximity to the Project 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	All necessary provisions requested are included within this application.
	(b) Include such other information as may be prescribed by regulations made by the appropriate minister[1].	Requirements under the Electricity Regulations 2007 are outlined in Table 2-1. Marine Scotland guidance (SOP) (MS-LOT, 2018) has also been considered throughout this application process.
3(3)	An application is not allowed to be made orally.	This document constitutes a written application to Marine Scotland.

[1] It should be noted that the application 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.	The locations of the installations are provided in Figure 3-3. A description of the various components required is provided in Section 4 and includes key properties for each type of structure.
	(ii) A description of how the installation operates (or is to operate).	Overviews of processes during the construction phase and operation and maintenance phase are provided in Section 5 and Section 6, 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 the subsea cables associated with the Project (including export cables, inter-array cables, and interconnector cables) is provided in Section 4.4
	(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 3-3. Further details are provided in Section 4.3.
	(v) Where the zone is sought in respect of more than one relevant renewable energy installation, the proposed or existing distances between such installations.	See Section 3.2.
	(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 operational phases are outlined in Section 8.
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;	See Section 1.2 for a description of works for which the safety zones will apply. Dates and durations of the 500m construction and major maintenance safety zones will vary depending on the associated activity, and as such the relevant details will be

ITEM	REQUIREMENT	WHERE ADDRESSED WITHIN THIS DOCUMENT
		promulgated as required. The 50m pre-commissioning zones will apply throughout the construction phase up until the point of commissioning.
	(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 Project.
	(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 procedures are outlined in Section 12.
	(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 marine traffic assessment is given in Section 9. This includes both Automatic Identification System (AIS) and radar data collected during 2019.
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 10 and potential impacts due to the presence of the safety zones are identified and assessed in Section 11.
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.	Notice of the application will be provided in a list of publications which will be agreed with Marine Scotland and will comply with the requirements of Regulation 4(1).
	(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.	

<table>
<tr><th>ITEM</th><th>REQUIREMENT</th><th>WHERE ADDRESSED WITHIN THIS DOCUMENT</th></tr>
<tr><td></td><td>(e)[2] 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.</td><td></td></tr>
<tr><td rowspan="2">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.</td><td>(a) The harbour masters of ports whose users are in the opinion of the applicant likely to be affected by the application.</td><td>Notice of the application shall be sent to a list of local harbour masters, which will be agreed with Marine Scotland.</td></tr>
<tr><td>(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.</td><td>Notice of the application will be sent to Aberdeen Coastguard Operations Centre under the remit of the Offshore Renewable Energy Liaison Officer.</td></tr>
</table>

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

3 Project Overview

3.1 Site Location

12. The Wind Farm Area is located in the outer Firth of Forth, 15.5 km directly east of Fife Ness on the east coast of Scotland (see Figure 3-2). The Wind Farm Area covers approximately 105 km^2. Offshore Export Cables will be located within the 300 m wide Offshore Export Cable Corridor, running in an approximately southwest direction from the Wind Farm Area, making landfall at Thorntonloch beach to the south of Torness Power Station in East Lothian.

13. The Offshore Consents allow for the construction and operation of the following main components, which together comprise the Project:

- 54 wind turbines generating a maximum generating output of around 450 Megawatts (MW);
- 54 jacket substructures installed on pre-piled foundations, to support the wind turbines;
- Two alternating current (AC) substation platforms, referred to as Offshore Substation Platforms (OSPs), to collect the generated electricity and transform the electricity from 66 kilovolt (kV) to 220 kV for transmission to shore;
- Two jacket substructures installed on piled foundations, to support the OSPs;
- A network of inter-array subsea cables, buried and/or mechanically protected, to connect strings of turbines together and to connect the turbines to the OSPs;
- One interconnector cable connecting the OSPs to each other;
- Two buried and/or mechanically protected subsea export cables to transmit the electricity from the OSPs to the landfall at Thorntonloch and connecting to the onshore buried export cables for transmission to the onshore substation and connection to the national grid network; and
- Minor ancillary works such as the deployment of metocean buoys and permanent navigational marks.

14. It is currently anticipated that offshore construction will take between two and three years and will commence in Quarter 2 (Q2) 2020. Figure 3-1 sets out an indicative programme of the main offshore construction activities.

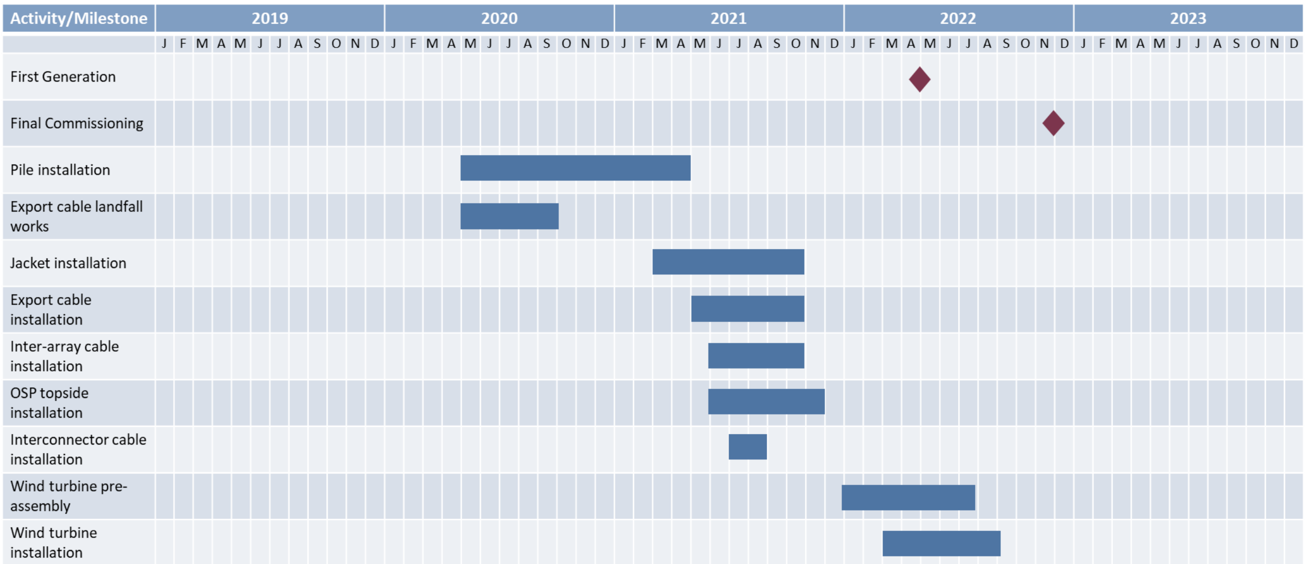

Figure 3-1: Indicative construction programme

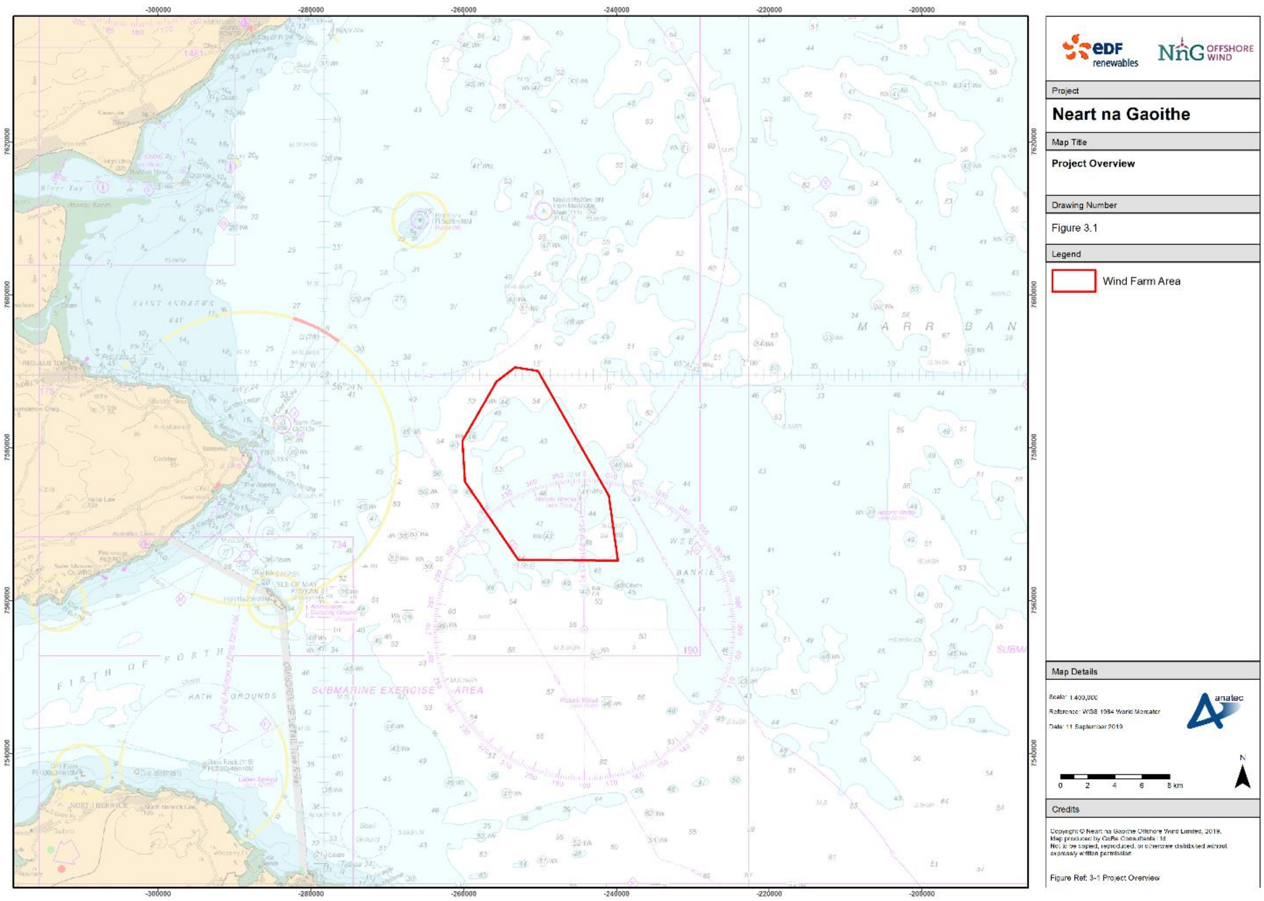

Figure 3-2: Project Overview

3.2 Site Layout and Structure Identification

15. The Project layout and identification marking system are shown in Figure 3 2. Coordinates of each turbine, OSP and spare location are provided in Appendix A. It should be noted that micrositing of certain

structures may be required in order to ensure viable installation. It is anticipated that micrositing of up to 100m may be required for a limited number of structures, however a 50m radius is expected to suffice in the majority of cases. Any micrositing over 50 m will be agreed in advance with the MCA.

16. At the time of writing, six spare locations are under consideration for use in the event that one of the intended positions proves unviable. Any structure placed in a spare location will require a safety zone therefore these positions are included in Figure 3-3 and Appendix A.

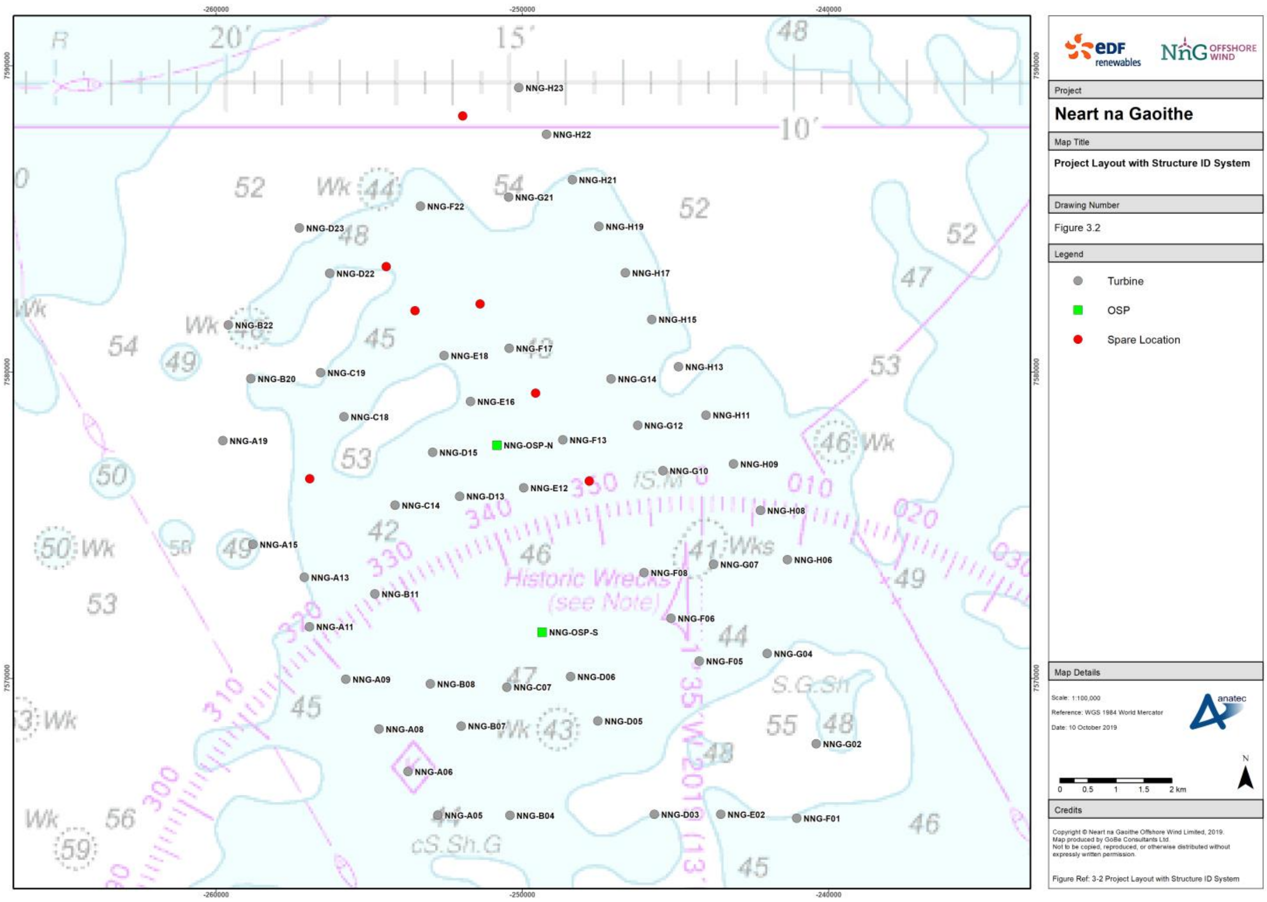

Figure 3-3: Project Layout with Structure ID System

17. Minimum spacing between the structures (including the OSPs) is 890m, however this varies across the wind farm, with average spacing being approximately 1,050m.

4 Project Components

4.1 Foundations

18. All turbines and OSPs will be installed on tripod steel jacket substructure foundations, attached to the seabed via three piles, each installed into a foundation casing. Key parameters of the relevant components are given in Table 4-1. These will be installed as per the process described in Section 5.1.

Table 4-1: Foundation Parameters

COMPONENT	SUMMARY
Turbine and OSP Foundation Piles and Casings	• 168 (56 x 3) piles and casings in total
Turbine and OSP jacket substructures (including transition piece, which connects the jacket with the turbine tower)	• 56 three legged structures in total • Height of between 83 and 88m • Approximate height of jacket visible from LAT: 29 – 34 m.
OSP Topside	• Height to top of topside 41 m.

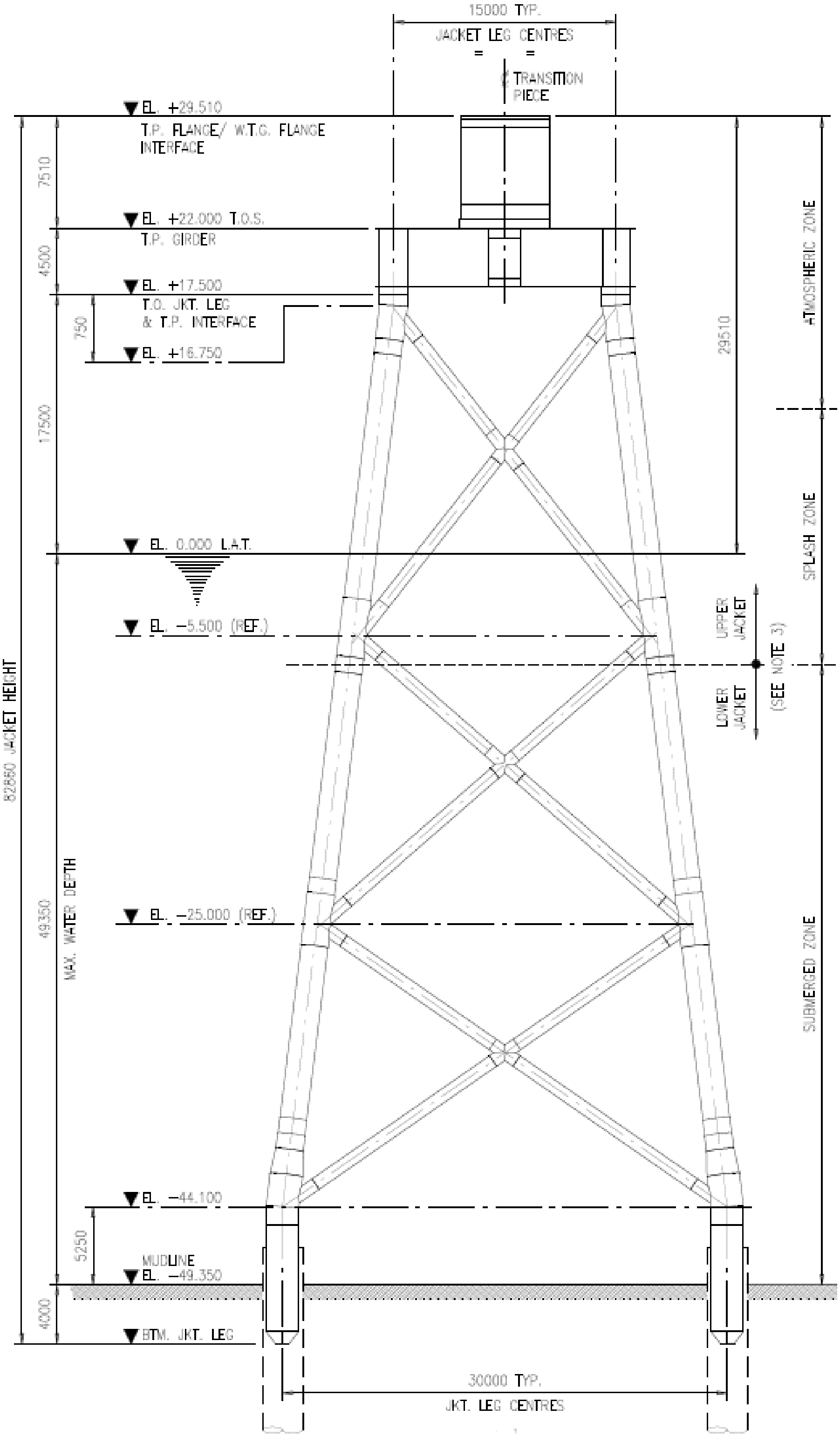

Figure 4-1: Illustration of turbine and OSP jacket relative to Lowest Astronomical Tide (LAT)

4.2 Turbines

19. As per Section 3.2, the layout includes 54 turbines installed within the Wind Farm Area, with each installed on a tripod jacket foundation as per Section 4.1. Key parameters of the turbines to be used are summarised in Table 4-2.

Table 4-2: Turbine Parameters

PARAMETER	VALUE
Number of Turbines	54
Max Tip Height (m above Lowest Astronomical Tide (LAT))	208
Max Hub Height (m above LAT)	126
Max Rotor Diameter (m)	167
Minimum Spacing (m)	890
Minimum Blade Clearance (m above LAT)	36
Foundation Type	Steel Jackets

4.3 OSPs

20. As per Section 3.2, the layout includes two OSPs installed within the Wind Farm Area, with each installed on a jacket foundation as per Section 4.1. Likely key dimensions of the OSPs are provided in Table 4-3.

Table 4-3: Likely OSP Parameters

PARAMETER	VALUE
Number of Offshore Substations	2 (Two)
Length of Topside (m)	32
Width of Topside (m)	24
Height of Topside (m)	14
Height to top of topside (m above LAT)	41

4.4 Cables

21. The OSPs will connect to the onshore grid via two offshore export cables making landfall at Thorntonloch prior to connecting to the electricity network. Each offshore export cable is approximately 37 km in length. The turbines and the OSPs will be connected via a network of inter-array cables, which are estimated to total an approximate 92 km in length, with the two OSPs connected together via an interconnector cable.

22. Cable routes are shown in Figure 4-2. The current cable layout is subject to minor route refinements and micrositing.

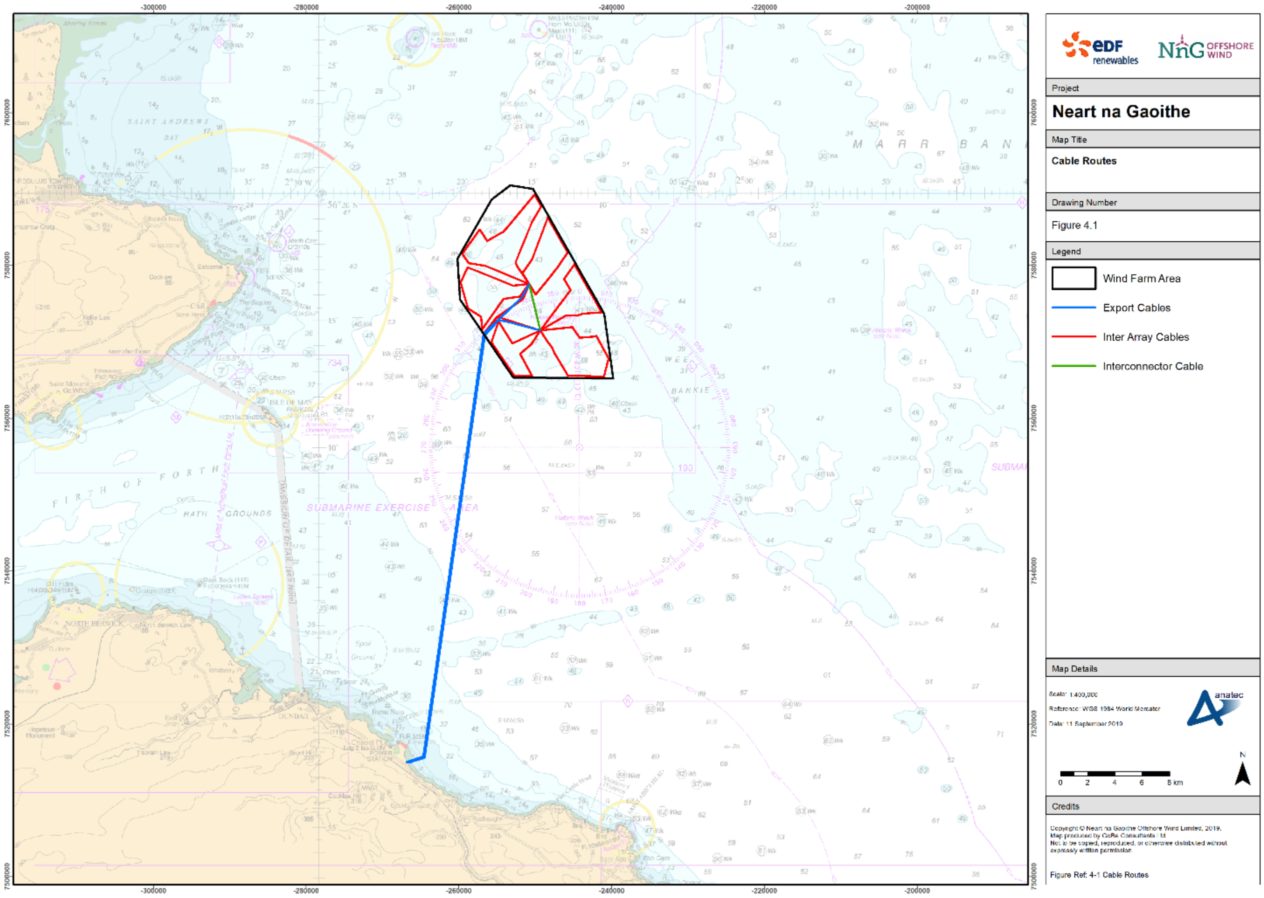

Figure 4-2: Cable Routes

5 Construction Overview

5.1 Piled Foundations and Jacket Installation

23. Pile and jacket installation will be undertaken from a Semi-Submersible Crane Vessel (SSCV) that will remain on site for the duration of the foundation and jacket installation campaign. The SSCV will be assisted by a Heavy Transport Vessel (HTV) that will deliver piles to the Wind Farm Area. The SSCV will install all piles at each turbine and OSP location. Once piling is complete at all locations, the SSCV will prepare for the installation of the jacket substructures onto the pre-installed piles.
24. For jacket installation the SSCV may be supported by one or two Offshore Construction Vessels (OCVs).
25. The jacket foundations will be delivered to site either via HTV or a barge and tug depending on the origin port. The delivery vessels will seek shelter near the Wind Farm Area until the jackets are ready to be installed. Deliveries to site will be staggered to correspond with the required installation windows for the jackets.
26. The delivery vessel will anchor within the Wind Farm Area and the SSCV will lift one jacket at a time onto its deck and relocate to the turbine or OSP location. The SSCV will then lift the jacket onto the pre-installed piles and grouting will be completed by one of the OCVs.
27. Various tugs will also be on site to support this stage of construction, in particular to assist with the mooring lines of the HTV and barge.
28. The piled foundation and jacket installation process is summarised as follows:
    - Installation vessel sets up at location;
    - Pile subsea template deployed onto seabed;
    - Piles upended into subsea template;
    - Drilling of pile socket commences using template as a guide, a Drive-drill-drive technique may be utilised at a small number of locations;
    - Grouting of pile socket connections;
    - Installation vessel then moves on to next location
29. Once all piles are installed across the site, the jackets will be installed:
    - Piles cleaned of marine growth by OCV;
    - SSCV will lift and install jacket on piles;
    - Grouting of jacket / pile connection;
    - Preparation for installation of turbine tower; and
    - Completion and move out.

5.2 Turbines

30. Turbine components will be collected from the marshalling harbour and subsequently transported to site by a Jack Up Vessel (JUV) for installation. It is anticipated that the JUV will return to port every 6-8 days, and will make up to 25 journeys in total with up to four sets of turbine components per trip. Installation of the turbine components will be undertaken by the JUV, with Crew Transfer Vessels (CTV) in support. A Service Operation Vessel (SOV) may also be used during this stage of construction.

31. At each location, the JUV will first install the turbine tower upon the jacket (see Section 5.1) using the following process:

- Temporary transition piece cover is removed;
- Rigging prepared for the tower lift;
- Lifting gear attached to the tower;
- Tag lines are attached to the tower base;
- Sea fastening bolts are dismantled;
- Turbine tower is lifted and guided into position on the foundation transition piece;
- Correct tower position confirmed;
- Connecting bolts are secured using torque and impact wrenches; and
- Lifting gear is disconnected from the tower with the top cover and recovered to the installation vessel.

32. The JUV will then proceed to install the nacelle on the tower, followed by the turbine blades, before moving on to the next jacket foundation to repeat installation sequence. Once all loaded sets of turbine components are installed, the JUV will return to the construction laydown port to load the next set of turbines.

5.3 OSPs

33. Foundation installation for the OSPs will follow the same general process as for the turbines (see Section 5.1). Once the foundations are installed, the export cables will be pulled in (see Section 5.5), and the topside will then be lifted and installed onto the jacket. Installation of the OSP topsides will be by a vessel similar to that used for installing the piles and jackets or by another HLV. The topsides will be delivered to the Wind Farm Area on a cargo barge direct from the point of fabrication.

34. Inter array cables (see Section 5.4) will then be pulled in. Once all cables have been terminated at the OSP cable deck the OSPs will be commissioned. A jack-up vessel will be mobilised to the OSP locations, and the OSPs will be commissioned.

5.4 Inter-Array Cables and Interconnector Cable

35. The seabed within the Wind Farm Area will be prepared in advance of cable installation via a pre-lay grapnel run (PLGR) undertaken by an on-site tug. Following this, a single Cable Laying Vessel (CLV) will collect the inter-array and interconnector cables from the port of origin and transport them to the Wind Farm Area where they will be installed. A Walk to Work (WTW) vessel will assist with pull in operations, termination, testing and preparation, and CTVs will be used to transfer personnel as and when required.

5.5 Export Cables

36. Prior to installation of the export cables, ducts will be installed via Horizontal Directional Drilling at the landfall point under Thorntonloch beach. PLGR will then be undertaken along the cable route in preparation for the cable installation. A CLV will be used to collect and subsequently install the export cables within the export cable corridor, beginning with cable pull in at the pre-installed ducts, supported by a Dive Support Vessel, if required.

37. Following pull in at the landfall, the CLV will install the cables, beginning at the landfall and ending at the OSPs.

38. Once installed, the cables will be buried. Where target burial depths are not able to be met, external protection will be used.

6 Operation and Maintenance Overview

39. As per Section 1.2, during the operational phase, safety zones are only being applied for around any structure where "major maintenance" is underway. The definition of "major maintenance" given within the Electricity Regulations 2007 is as follows:

"works relating to any renewable energy installation which has become operational, requiring the attachment to, or anchoring next to, such an installation of a self-elevating platform, jack-up barge, crane barge or other maintenance vessel."

40. Under this definition, vessel types that will trigger a major maintenance safety zone include but are not limited to:

- Service Operations Vessels (SOVs) (see Section 7);
- JUV;
- Multi-purpose vessels
- Floating barges; and
- HLV.

41. Full details of major maintenance activities that will occur as part of the operation of the Project will vary through the life of the project and will include replacement of defective components, upgrade works to improve the performance of components and remedial actions to proactively address Operation and Maintenance (O&M) risks. Based on the information available, indicative examples include:

- Turbine generator or main bearing replacement;
- Turbine transformer replacement
- Turbine blade repair/replacement;
- Turbine nacelle replacement;
- OSP transformer replacement;
- Repairs to the structure
- Operations involving a Walk to Work vessel;
- Operations involving a multi-purpose vessel and
- Operations involving heavy lifts.

42. Where necessary during major maintenance, details of the work being carried out, the associated vessels engaged in the works, and the safety zones in place shall be promulgated through local Notice to Mariners and radio warnings as designated by the United Kingdom Hydrographic Office (UKHO).

7 Service Operations Vessel (SOV)

43. NnGOWL is likely to use SOVs with WTW systems during both the construction and operational phases of the Project (see Figure 7.1 below). There are risks to personnel and infrastructure associated with operating a WTW system and to reduce risk this application includes for 500m safety zones around structures when an SOV is attached or on station next to the structure.

44. As per Section 6, an SOV falls under the definition of "Major Maintenance" given in the Electricity Regulations 2007 (given that it attaches to the structure) and is hence eligible for the corresponding 500m safety zones afforded to such operations. A detailed justification as to why the safety zones triggered by SOVs are considered necessary is provided in Section 10.

45. It is noted that a safety zone around a structure will only be triggered when an SOV is attached to or on station next to that structure (including in the event that the SOV is required to engage in lifting operations via it's on board crane).

Figure 7-1: WTW System Illustration courtesy of Esvagt

7.1 Indicative Parameters

46. The exact O&M vessels to be used are yet to be chosen, however approximate parameters of a typical SOV under consideration are shown in Table 7-1.

Table 7-1: Indicative SOV Parameters

PARAMETER	VALUE
Length	85m
Breadth	20m
Maximum Draft	7m
Personnel on Board	60

7.2 Walk to Work

47. The SOV will utilise a WTW system to transfer personnel to the WTGs, as illustrated in Figure 7-1, which provides an indicative portrayal of the WTW system courtesy of Esvagt.

48. The length of time personnel are required to be stationed on a structure will vary by operation. On this basis, the SOVs will either remain stationed at a structure, or drop off technicians and return at a later time for pick up depending on the requirements of the specific operation being undertaken.

49. In the event of an emergency (e.g., a potential collision incident), the SOV has procedures in place to evacuate the WTW system, and subsequently disconnect. However, given that this may lead to personnel being left on a structure (and therefore vulnerable in an emergency situation), risk assessment has identified the need for these safety zones around structures to which the SOVs are attached to ensure the potential for an emergency situation and unplanned evacuation is minimised

8 Lighting and Marking

50. This section outlines the marine lighting and marking to be implemented for the Project during the construction, and operation and maintenance phases. Aviation lighting and marking is not considered pertinent to the safety zone application and is therefore not included. However full details of the lighting and marking scheme (both marine and aviation) will be available in the approved Lighting and Marking Plan (LMP, Doc Ref: NNG-NNG-ECF-PLN-0009).

8.1 Construction Phase

51. 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.

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

53. Construction phase buoyage shall consist of four cardinal marks and five special marks, as shown in Figure 8-1.

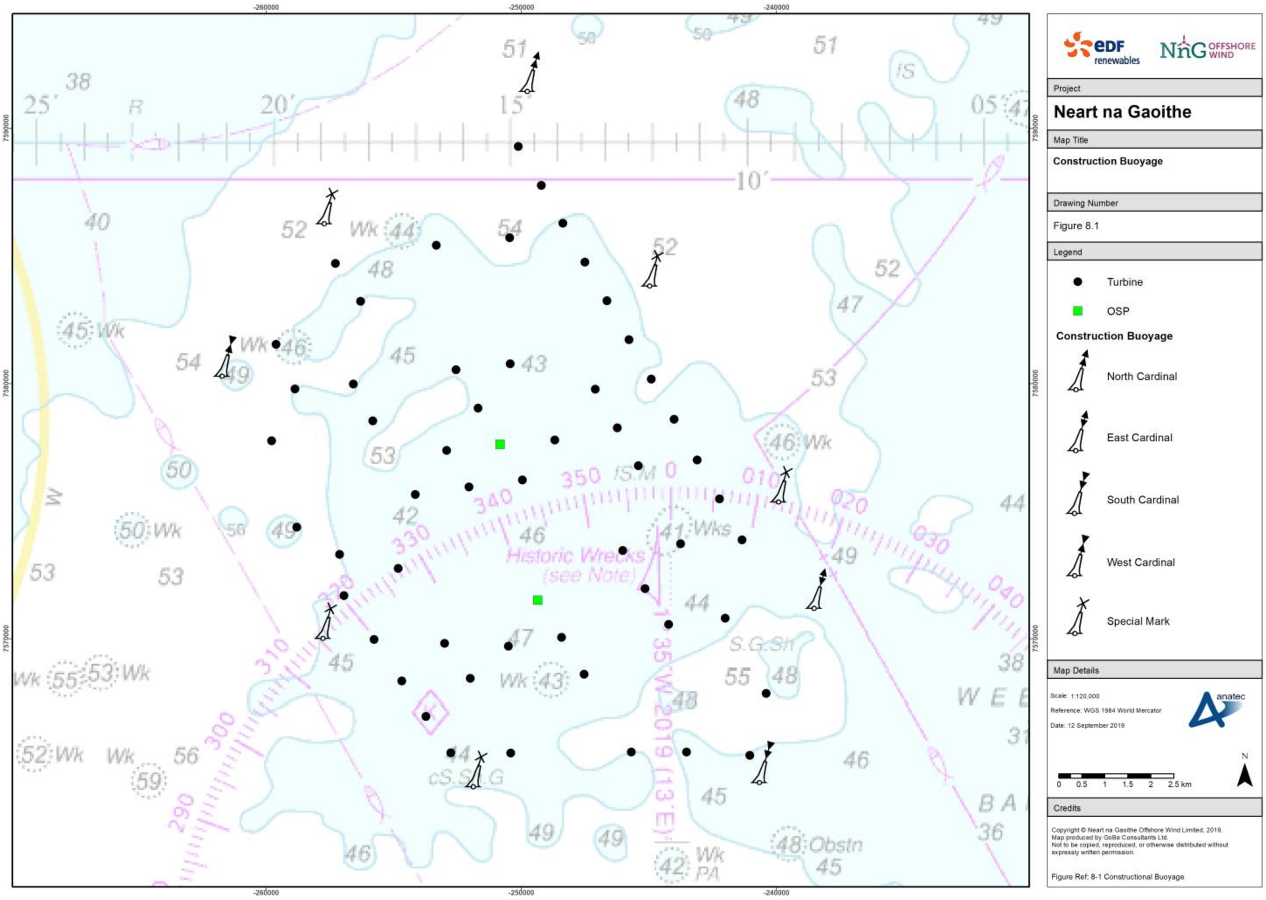

Figure 8-1: Construction Buoyage

54. In addition to the buoyage, the transition piece of each turbine will be fitted with a mounted Fl Y 2.5s light (visible through 360°) with a 2 nautical mile (nm) range. These lights will meet an IALA Availability Category 2 (not less than 99%) and be in place until the operational phase lights have been commissioned.

8.2 Operational Phase

55. In line with the relevant IALA guidance (O-139) and NLB requirements, certain periphery structures have been designated as Significant Peripheral Structures (SPS). Each SPS is to be fitted with a 5 nm light (FL. Y. 5s), with 360° visibility. All SPS will flash in synchronisation and will satisfy IALA availability requirements for Category 1 AtoN (>99.8% availability).

56. All SPS will also be fitted with fog signals, which will sound when visibility in the area is less than 2 nm (as determined by visibility metres fitted to the relevant turbines). Whilst active, the signals will sound every 30 seconds (s), and will be audible over 360°. All fog signals will satisfy IALA availability requirements for Category 3 AtoN (>97% availability).

57. Four SPS will also transmit via AIS, with the installed AIS transmitters satisfying IALA availability requirements for Category 3 AtoN (>97% availability). NnGOWL or an appointed contractor will procure the relevant AIS licences via applications to Ofcom as required.

58. Each wind farm structure will display identification panels with black letters / numbers on a yellow background visible in all directions and will be painted in line with IALA O-139 requirements. Full details

of turbine paint design are available in the Development Specification and Layout Plan (DSLP, Doc Ref: NNG-NNG-ECF-PLN-0003).

59. The operational lighting and marking scheme is summarised in Figure 8-2.

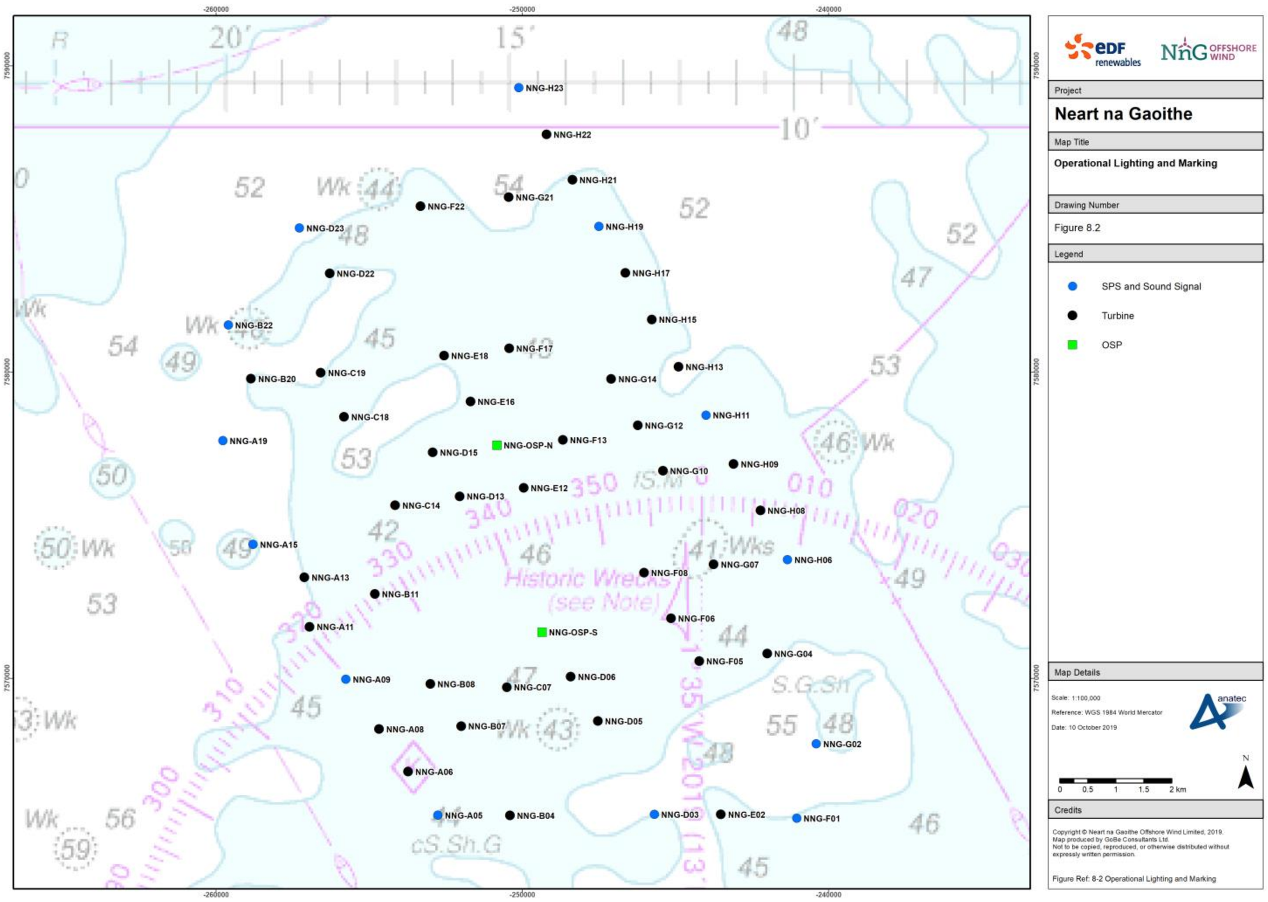

Figure 8-2: Operational Lighting and Marking

9 Marine Traffic Assessment

9.1 Data Sources

60. The primary data source considered within this safety zone application is 28 days of marine traffic data collected during December 2018 and July 2019. This data set contains a combination of AIS and Radar data, with periods chosen to account for seasonal variation as follows:

- 14 days AIS and Radar collected by the *Seagull* survey vessel during July 2019; and
- 14 days of AIS data collected via onshore receivers during December 2018.

61. This data has been collected to ensure the marine traffic assessment considered for the Safety Zone Application is up to date. However, given that safety zones were identified within the Application, and in particular within the Navigation Risk Assessment (NRA) (Anatec, 2012) as a necessary mitigation measure, it was considered pertinent to also consider (on a secondary basis) the associated marine traffic data sets already assessed:

- 60 days of AIS and Radar data collected during 2010/11 for the NRA (Anatec, 2012); and
- 28 days of AIS data collected during 2016, collected for the purpose of validating the findings of the NRA via a validation exercise (Anatec, 2016).

62. The validation exercise in 2016 concluded no significant changes affecting the findings of NRA, and therefore the secondary assessment focuses on the validation data, however the NRA data is referenced where appropriate.

63. All assessment in this section is based on a study area comprising a 10nm buffer of the Wind Farm Area.

9.2 Vessel Count

64. The number of unique vessels recorded per day in the study area during the 28-day survey period is shown in Figure 9-1. It should be considered that the summer period included non-AIS vessels recorded via Radar as per Section 9.1, whereas the winter period was AIS only.

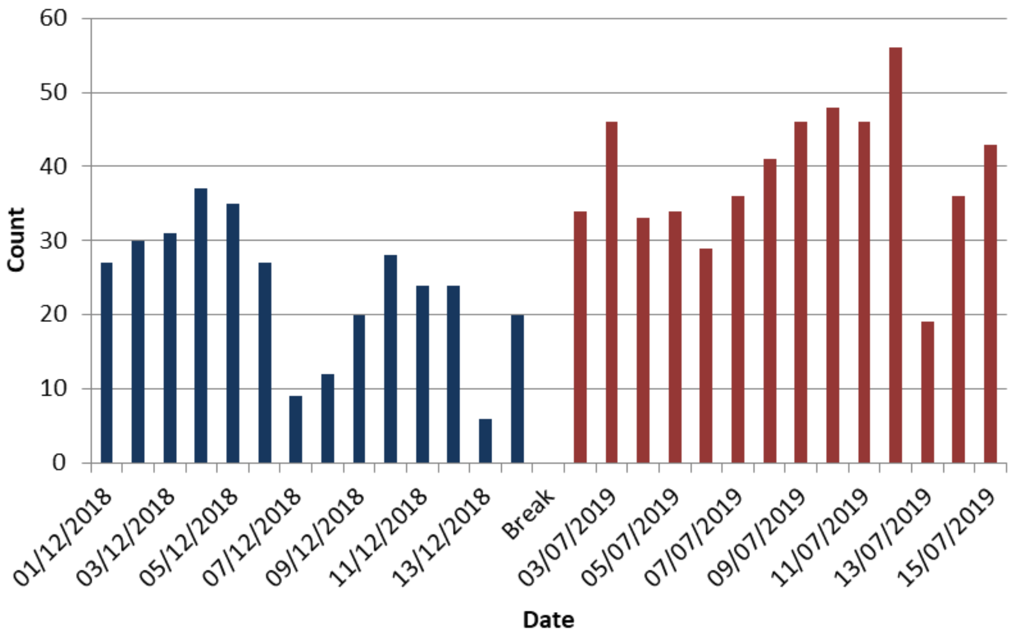

Figure 9-1: Daily Counts (2018/19)

65. Traffic levels during the summer period were observed to be higher than in winter, with an average of 22 unique vessels per day recorded per day in winter, rising to 39 in summer. This seasonal variation was observed to be largely due to a significant increase in recreational activity in summer, when compared to the winter period (see Section 9.6 for further details), however fishing vessel activity was also observed to be higher in summer than in winter (see Section 9.5).

66. Recorded traffic levels have been observed to rise during the 2018/19 data when compared against the data collected for the NRA and subsequent 2016 validation, as can be seen in Table 9-1.

Table 9-1: Daily Count Comparison

DATASET	PERIOD	AVERAGE UNIQUE VESSELS PER DAY*	
		STUDY AREA	WIND FARM AREA
Safety Zone Application Data	July 2019	37	4
	December 2018	23	2
2016 Validation	June 2016	21	2
	December 2016	23	3
NRA	Aug/Sept/Oct 2010	16	2
	July 2011	13	2

* Values exclude vessels recorded via Radar to ensure as fair comparison as is practical.

67. The increase in vessel numbers was largely observed to be due to levels of fishing vessel activity, with significantly more fishing vessels recorded during the 2018/19 data when compared against the NRA and validation periods (see Section 9.3). Traffic within the Wind Farm Area itself has remained more consistent, however it should be considered that the presence of survey vessel activity during 2019 is likely to mean that vessel numbers within the Wind Farm Area are atypical.

68. On this basis the finding of the NRA and EIA Report that safety zones are a necessary mitigation measure are still considered valid based on the 2018/19 data, given that traffic levels within the Wind Farm Area are consistent.

9.3 Vessel Type

69. The vessel types recorded in the study area during winter and summer are shown in Figure 9-2. Following this, the distributions of vessel type recorded within the study area during the summer and winter periods are shown in Figure 9-3.

70. It should be considered when viewing the type analysis that approximately 3% of vessels are of an unspecified type. All such vessels were recorded via Radar during the summer survey, and were unable to be identified visually by the survey vessel. However, it is considered likely that the majority of these vessels were small fishing or recreational vessels based on their activity and the fact that they were not transmitting via AIS. Regardless, unspecified vessels have been excluded from the analysis shown in Figure 9-3.

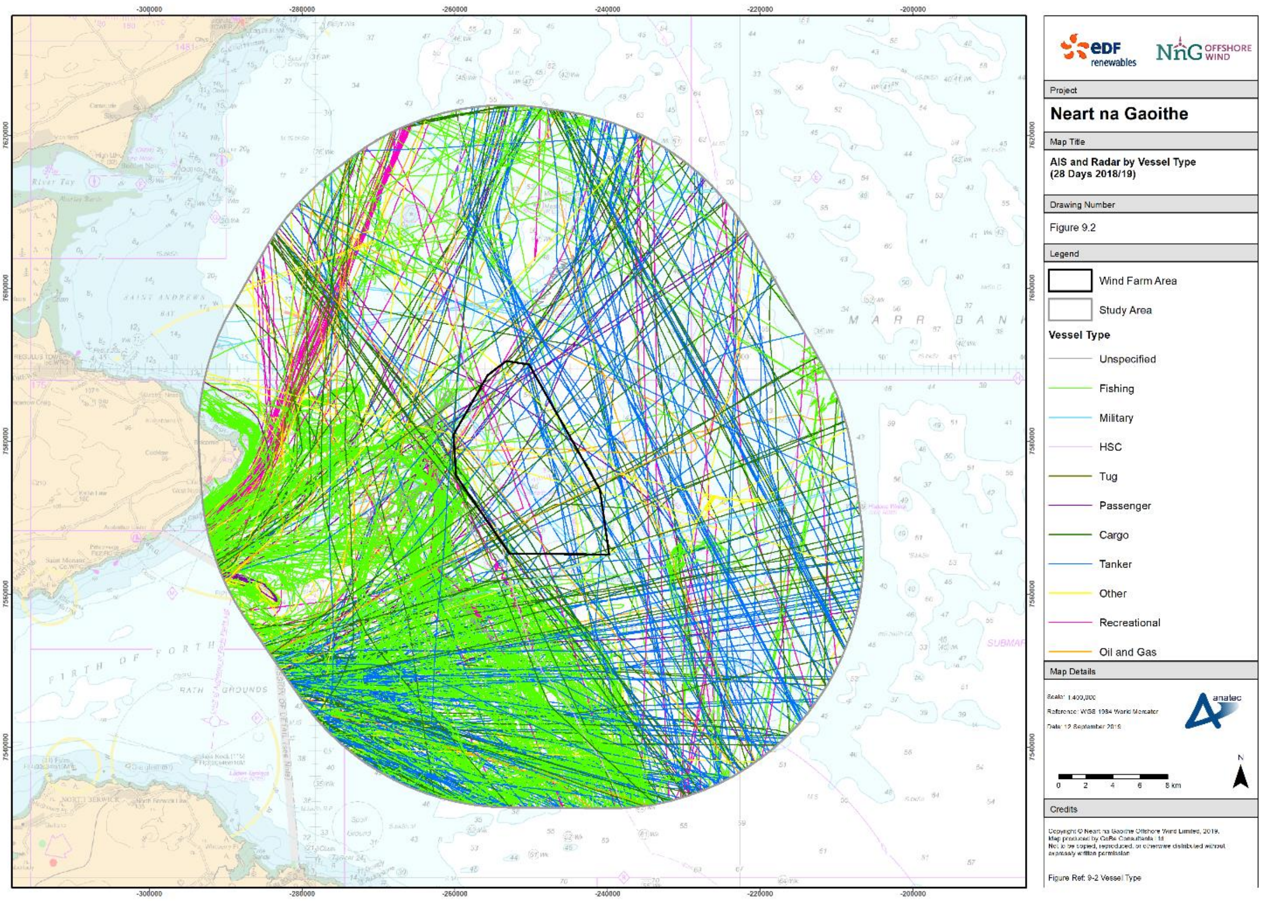

Figure 9-2: AIS and Radar by Vessel Type (28 Days 2018/19)

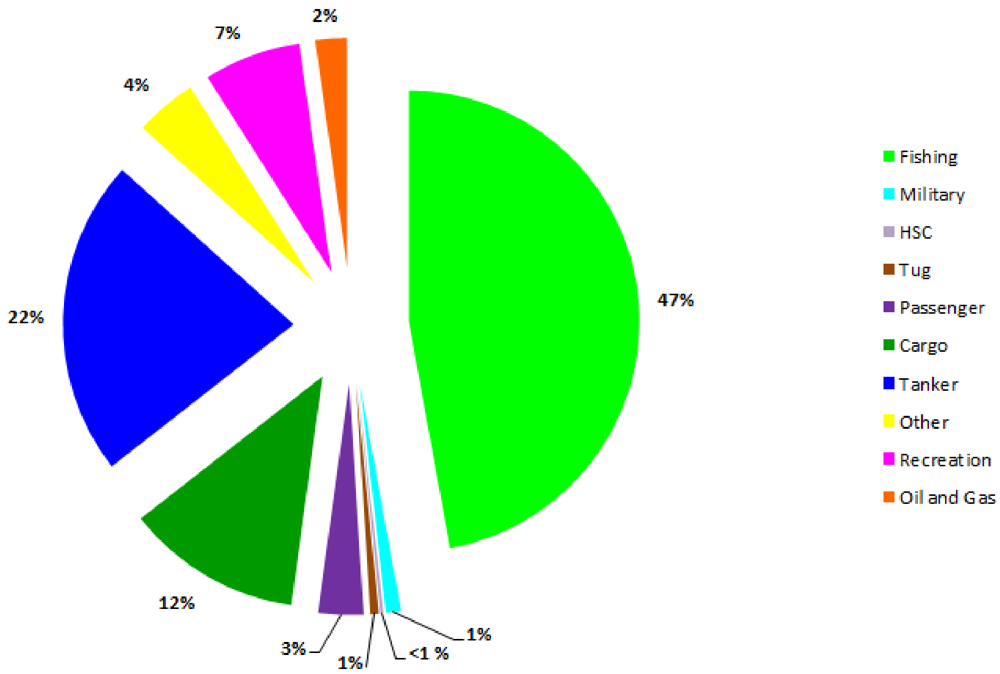

Figure 9-3: Vessel Type Distribution (28 Days 2018/19)

71. The most common vessel type recorded over the 28 day survey period was fishing, with such vessels accounting for approximately half of all traffic recorded. Commercial vessels (cargo and tanker) were also recorded at notable levels during both survey periods, accounting for a combined 34% of traffic overall. There was good correlation overall between the summer and winter periods in terms of vessel type, other than an increase in fishing and recreational vessel activity during summer (see Sections 9.5 and 9.6 respectively).

9.4 Commercial Vessels

72. The commercial vessels (cargo and tanker) recorded within the study area during the study period are shown in Figure 9-4.

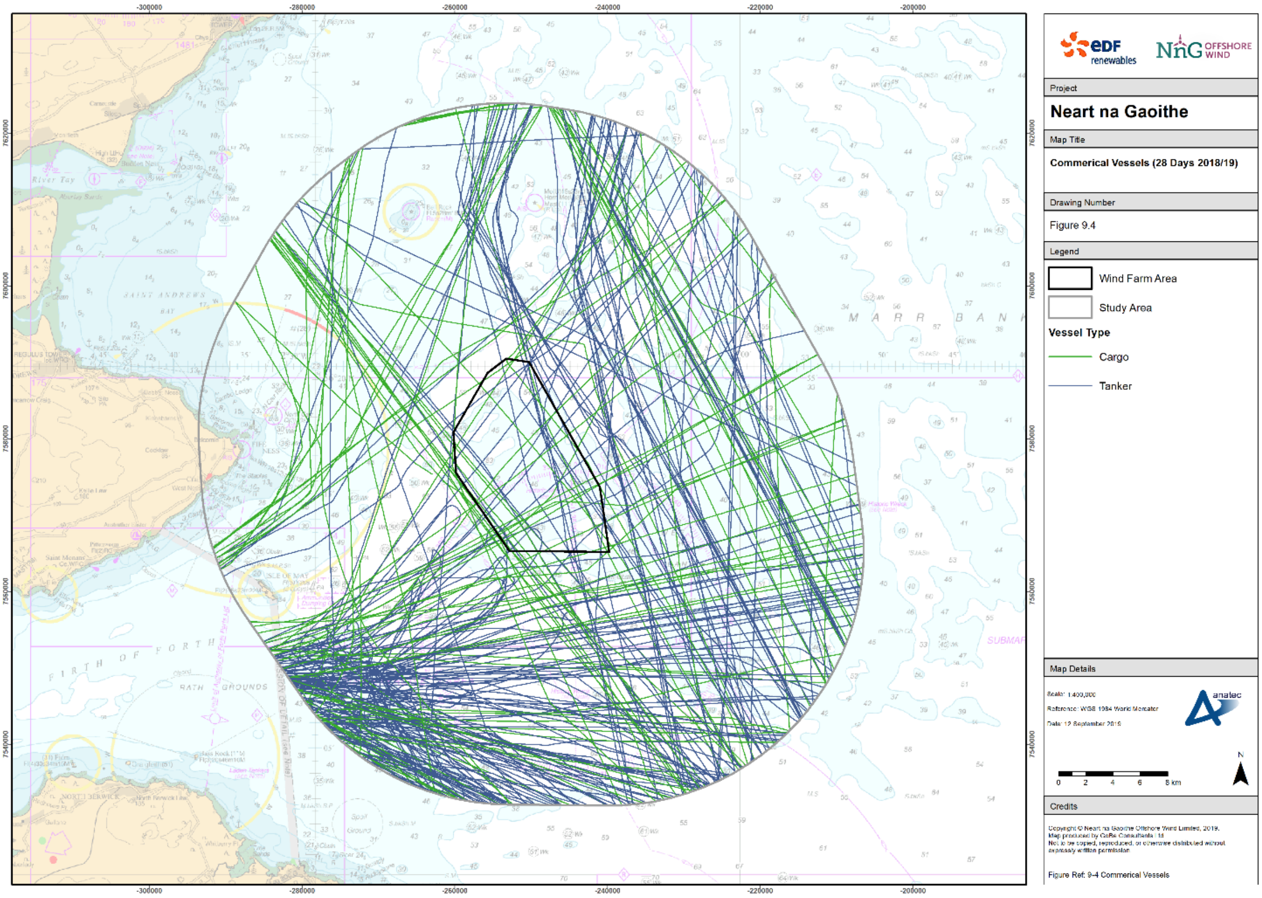

Figure 9-4: Commercial Vessels (28 Days 2018/19)

73. The majority of the cargo vessels and tankers recorded were observed to be associated with ports in the Firth of Forth, and such vessels most commonly passed south of the Wind Farm Area. Commercial traffic passing through the Wind Farm Area itself was observed to largely comprise vessels on routes between Scottish ports and either ports further south on the United Kingdom (UK) coast (most commonly Immingham) or mainland Europe.

74. An average of seven unique tankers per day were recorded within the study area, in addition to four unique cargo vessels. An average of one tanker and one cargo vessel per day (i.e., two commercial vessels in total) transited through the Wind Farm Area. These values are in line with the 2016 validation data, where one cargo vessel and one tanker per day were also recorded as intersecting the Wind Farm Area.

75. One tanker (the *Nautilus*) was observed as undertaking "waiting" manoeuvres south of the Wind Farm Area. This is discussed further in Section 9.7, which assesses anchoring activity recorded within the study area.

9.5 Fishing Vessels

76. The fishing vessels recorded in the study area during the study period are shown in Figure 9-5, colour coded by period (i.e., December 2018 or July 2019) and recording source (i.e., AIS or Radar). It should be considered that, as discussed in Section 9.3, it is considered likely that a proportion of the vessels recorded via Radar but unable to be identified visually were fishing vessels based on their locations and behaviours.

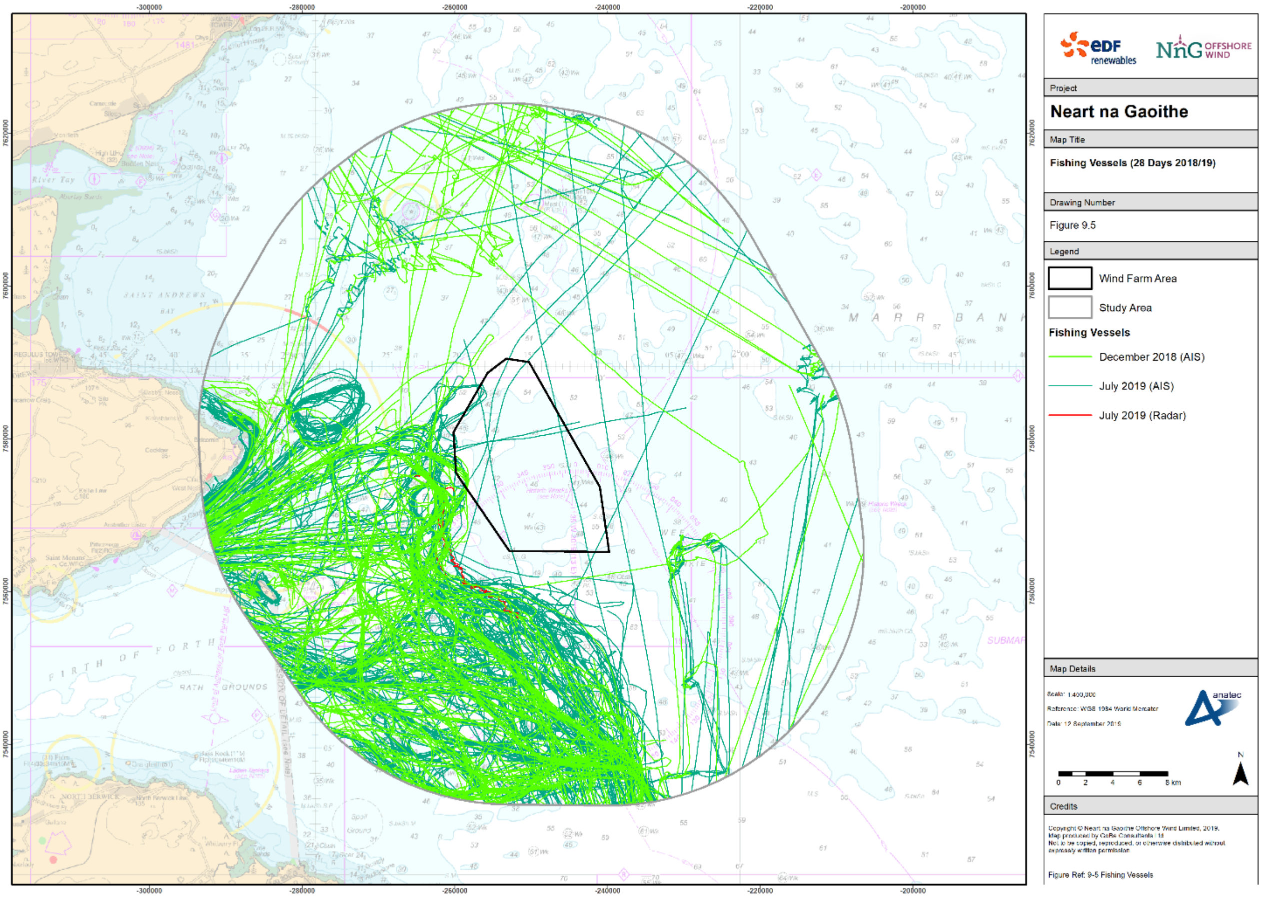

Figure 9-5: Fishing Vessels (28 Days 2018/19)

77. The majority of the fishing activity was in the south west of the study area, with minor levels of activity also recorded offshore (north and east) of the Wind Farm Area. This activity was observed to be largely from demersal trawlers, with some potting, dredging, and gill netting also recorded.

78. Activity within the Wind Farm Area was limited (less than one vessel per day), however it should be considered that survey work was ongoing at the time of the summer survey, and that NnGOWL have agreements in place with local fishing vessels covering ongoing pre-construction geophysical surveys. These factors may be affecting fishing activity levels within the Wind Farm Area, however it is noted that the observed levels are in line with the findings of 2016 validation survey. Given that the 2016 survey was AIS only, it should still be considered that fishing activity within the Wind Farm Area may be underrepresented.

79. Fishing activity was busier in summer than in winter, with an average of 18 unique fishing vessels recorded per day during July 2019, compared to 12 per day in December 2018. This is likely due to more favourable conditions for smaller vessels during the summer period, however it should be considered that the winter survey was AIS only, and any fishing vessels of less than 15m would therefore not be accounted for.

9.6 Recreational Vessels

80. The recreational vessels recorded within the study area during the study period are shown in Figure 9-6, colour coded by period (i.e., December 2018 or July 2019) and recording source (i.e., AIS or Radar). It should be considered that, as discussed in Section 9.3, a proportion of the vessels recorded via Radar but

unable to be identified visually may have been recreational vessels based on their locations and behaviours.

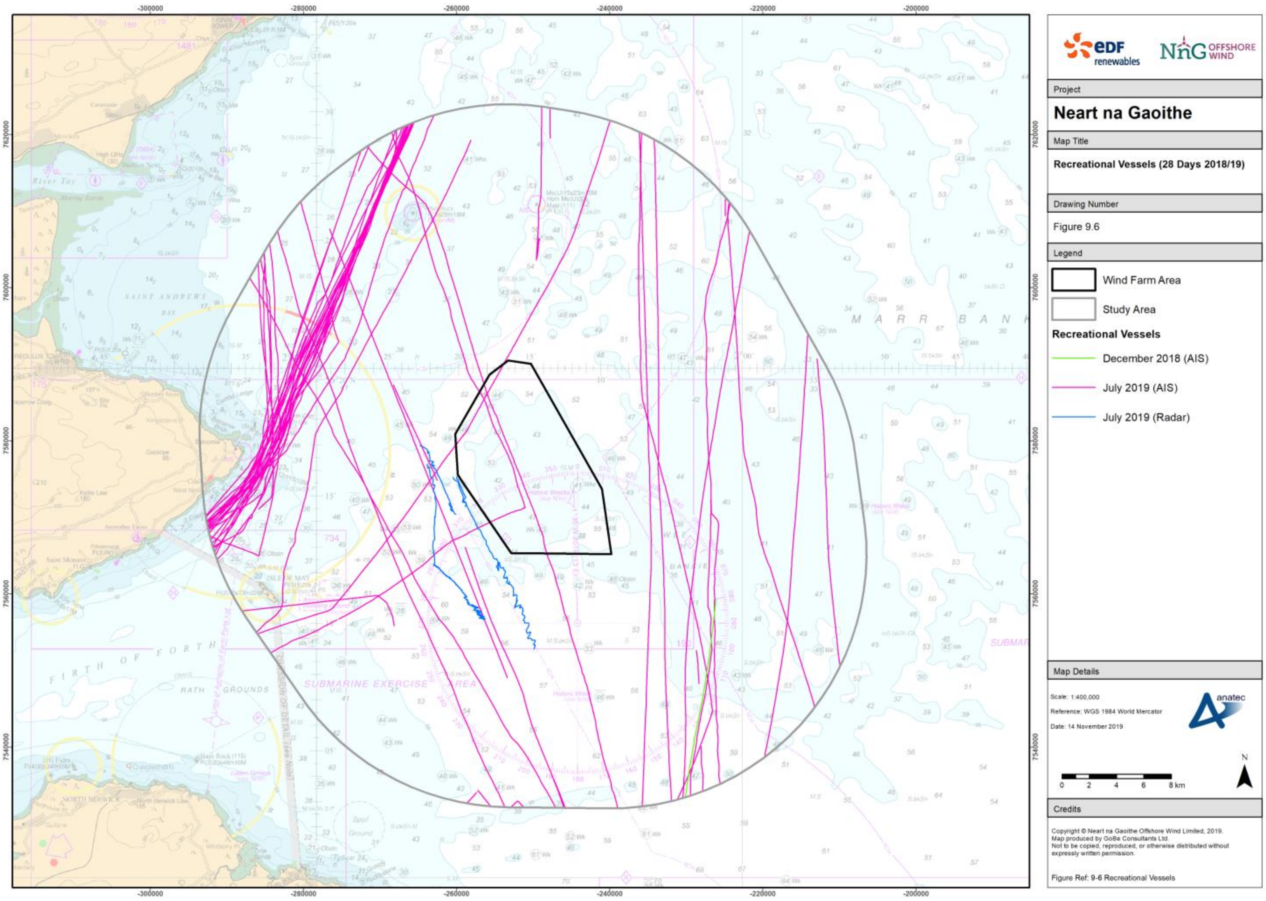

Figure 9-6: Recreational Vessels (28 Days 2018/19)

81. Recreational activity was observed to be much busier in summer than in winter, with four unique recreational vessels per day recorded during summer, compared to just one recreational vessel recorded over the entire winter period. This is typical of recreational activity, given that conditions during winter periods are unfavourable for recreational transits. However, it should be considered that the winter survey was AIS only, and therefore any recreational vessels not broadcasting via AIS will not be accounted for within the December 2018 data.

82. The majority of recreational activity was observed to be coastal, however transits further offshore were recorded, including three transits through the Wind Farm Area itself. Two of these vessels were able to be identified as sailing vessels, however the third could not be classified from the available information. It should be considered that the presence of survey works within the Wind Farm Area may mean that local recreational activity was atypical.

83. The recorded levels of recreational activity are higher than those of the 2016 validation survey, where an average of only one vessel per day was recorded within the study area, with no recreational vessels recorded within the Wind Farm Area. Just 5% of vessels identified as being recreational in the 2018/2019 data were recorded via Radar, and it may be the case that more recreational vessels in the area are utilising AIS compared to in 2016.

9.7 Anchored Vessels

84. Vessels transmitting a status of "At Anchor" via AIS or vessels transmitting another status but exhibiting behaviour which may indicate anchor deployment were identified and subsequently checked to identify any cases of anchoring within the study area. Based on this analysis, only one vessel was deemed as being at anchor, the *Ivs Knot*, a cargo vessel of length 176 m. The vessel was at anchor between the 4th and the 11th of July at a distance of approximately 10nm from the Wind Farm Area.

85. Overall, this represents a reduction in anchoring activity when compared to the 2016 validation data, where tankers were identified as regularly anchoring south of the Wind Farm Area to await orders. It is not clear why this activity has reduced, however it may be that tankers are undertaking "waiting" manoeuvres in the area when awaiting orders, rather than deploying anchor, noting that as per Section 9.4, such activity was recorded within the study area. Regardless, anchoring activity is low, and as such no associated impacts are expected from the safety zones as is discussed in Section 11.4.

10 Need for Safety Zones

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

10.1 Reduction in Collision Risk

87. Throughout the construction phase of the Project, a number of construction vessels shall be within the buoyed construction area carrying out the installation of foundations, turbines and inter-array, inter-connector cables and export cables. This shall involve the utilisation of a large variety of vessels. The multi-activity nature of the construction phase may result in large numbers of these vessels being on-site simultaneously, including vessels which are Restricted in Ability to Manoeuvre (RAM). During any particular construction activity at a given location the likelihood is that only one large vessel shall be present, with support from a number of smaller vessels, however multiple large vessels may be required under certain circumstances.

88. Vessel numbers during operation are anticipated to be significantly less than during construction. However, during periods of significant maintenance there may be a requirement for RAM vessels, and an SOV will also form part of maintenance operations (noting that SOVs are covered under the definition of major maintenance as per Section 6).

89. As per Section 9, approximately four unique vessels per day transited through the Wind Farm Area during the summer survey period studied. This fell to two per day in the winter 2018 survey period. Additionally, commercial vessel routes pass both inshore and offshore of the Wind Farm Area, and active fishing was recorded within the immediate vicinity. The presence of RAM construction and maintenance vessels create additional collision risk, and it is therefore necessary to implement safety zones around structures when such vessels are stationed.

90. 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 construction or major maintenance activities (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 12.

91. 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 Wind Farm Area during the construction phase;
- Charting of the structures within the Wind Farm Area during all phases;
- Provision of a Marine Coordination Centre to monitor Very High Frequency (VHF) and AIS;
- Where identified as necessary via risk assessment, provision of a guard vessel(s); and
- Promulgation of information (e.g. Notice to Mariners, Kingfisher bulletins, weekly Notices of Operations, etc.).

10.2 Reduction in Allision Risk

92. Throughout the construction phase of the Project, any partially completed or pre commissioned wind farm structures pose an allision risk to passing traffic, particularly earlier in the construction phase when mariners may be less aware of the Project and the associated construction activities. It is also noted that during construction the operational lighting and marking scheme will not yet be commissioned. The use of a guard vessel(s) (where necessary) may discourage vessels from approaching the Wind Farm Area, however the use of mandatory 500 m safety zones around structures where construction is ongoing (or 50 m for partially complete / pre commissioned structures) will make it clear which areas should be avoided.
93. 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 Project and therefore reduce the overall allision risk.
94. Again, should a vessel approach or infringe a safety zone they shall be alerted using the standard procedures outlined in Section 12.
95. Other mitigation measures which shall be implemented to reduce the allision risk during construction and operation and maintenance phases include:
    - Lighting of partially completed structures with a construction phase navigational light (Fl Y 2.5s with 2 nm range visible through 360°);
    - Use of buoys to mark the Wind Farm Area during the construction phase;
    - Charting of the structures within the Wind Farm Area during all phases;
    - Provision of a Marine Coordination Centre to monitor Very High Frequency (VHF) and AIS;
    - Where identified as necessary via risk assessment , provision of a guard vessel(s) ; and
    - Promulgation of information (e.g. Notice to Mariners, Kingfisher, bulletins, weekly Notices of Operations, etc.).

10.3 Protecting NnGOWL Personnel

96. Throughout the construction phase and during periods of major maintenance of the Project there shall be a significant number of personnel working in the Wind Farm Area and surrounding sea area. Given the collision and allision risk (see Sections 10.1 and 10.2, respectively) there is a risk (albeit a low level and infrequent risk) of loss of life or injury to both NnGOWL personnel and the crews of passing vessels.
97. As per Section 7, an SOV equipped with a "walk to work" system will be utilised during the construction and operation and maintenance phases. While personnel are in the process of transferring, or stationed on the turbines themselves having successfully transferred, they are at risk should a potential allision or collision scenario occur. During any such sensitive operation where the SOV is attached to a structure, it is therefore necessary to make clear to passing traffic the area which should be avoided to ensure the risks to personnel are As Low As Reasonably Possible (ALARP).
98. The implementation of mandatory 500 m safety zones in conjunction with other mitigation measures such as the use of a guard vessel (where necessary) will ensure that vessels are able to passage plan effectively in order to pass the Wind Farm Area at a safe distance, thus minimising the risk to the crew.

10.4 Prevention of Dangerous Behaviour

99. Experience at other wind farms has indicated that third party vessels do pass sensitive operations at distances which are of concern to the construction or maintenance vessels engaged in those operations (including SOVs). During such operations the Project vessels will be fully compliant with the International Regulations for Preventing Collisions at Sea (COLREGS) (International Maritime Organization (IMO), 1972), including watch keeping requirements.

100. Experience shows that COLREGS does not fully provide the Project vessels the required level of mitigation to ensure that safe operations are not impacted by passing vessels. Although COLREGS provides responsibilities for vessels at sea, a clear demarcation of areas to be avoided for the safety of the Project vessel, personnel, and third-party vessels and crew due to the risks of the operations occurring is required. By promulgating safety zones both in advance and at the time of operation, vessels can effectively passage plan to ensure they stay clear of any sensitive or dangerous operations, as identified by risk assessment. A 500m safety zone radius is well known as a safe passing distance in the offshore wind industry and prevents the ambiguity often presented in the wording of COLREGS. For example, Rule 18 states that:

> *A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of:*
>
> *i. a vessel not under command (NUC);*
>
> *ii. a vessel restricted in her ability to manoeuvre (RAM).*

101. “So far as is possible” is not defined, which often leads to confusion. The intention of safety zones is not to over-regulate or prosecute the third-party mariner, but to ensure that those mariners are aware that entering those safety zones could lead to dangerous occurrences.

10.5 Assistance in Passage Planning

102. As per the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974), all vessels are required to passage plan before proceeding to sea, taking all known and relevant factors into consideration. The implementation of safety zones will make it clear to all vessels the areas which should be avoided within the site while constructing or once operational (where maintenance is underway), which as noted in Section 10.4 will allow for effective passage planning and remove any ambiguity as to what warrants a safe passing distance.

10.6 Reduction in Risk of Interaction with Anchor Spread

103. During the construction phase or during periods or major maintenance, vessels may be required to be fixed to the seabed by a spread of anchors. The presence of subsea anchors and anchor chains gives rise to the risk of a passing vessel interaction, which could have severe consequences both for passing traffic, and the construction / maintenance vessels.

104. 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 12, an on-site vessel assigned with monitoring duties 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.

10.7 Reduction in Fishing Gear Snagging Risk

105. As per Section 9.3, fishing vessels were the most common type of traffic present in the study area within the 2018/19 marine traffic data studied (approximately half of all traffic overall). 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 (as a worst case) the capsize of a fishing vessel.

106. The implementation of mandatory 500 m safety zones during construction or major maintenance activity (or 50 m for pre commissioned structures) in conjunction with other mitigation measures such as the use of a guard vessel (where appropriate) and the Marine Coordination Centre, the buoyed construction area and charting of the structures within the Wind Farm Area would increase awareness of the ongoing works and allow fishermen to passage plan effectively to avoid the Project, therefore reducing the likelihood of a gear snagging incident.

107. As per Section 12, were a fishing vessel to approach or infringe a safety zone, contact would be made by the on-site vessel assigned monitoring duties to identify the area of danger to the fishing vessel, thus reducing the risk of a gear snagging incident.

10.8 Accounting for Inexperienced Mariners

108. As shown in Section 9.6, recreational transits were recorded within the 2018/19 marine traffic data studied. The majority of this traffic was observed to remain coastal, however limited recreational transits through the Wind Farm Area were recorded.

109. 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.

110. The implementation of mandatory 500 m safety zones during construction or major maintenance activity (or 50 m for pre commissioned structures) in conjunction with other mitigation measures such as the use of a guard vessel (where appropriate) and the Marine Coordination Centre, a buoyed construction area and charting of the structures within the Wind Farm Area 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.

111. As per Section 12, were a recreational vessel to approach or infringe a safety zone, contact would be made by the on-site vessel assigned monitoring duties to identify the area of danger to the recreational vessel.

10.9 Accounting for Unforeseen Risk

112. Throughout the construction phase and periods of major maintenance of the Project 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;

- Structural failure of a wind farm component;
- Unanticipated adverse weather; and
- Accidental interaction with unexploded ordnance or a wreck.

113. 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.

11 Impact of Safety Zones

114. 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 Project based on the findings of the marine traffic assessment undertaken in Section 9.

11.1 Passing Commercial Traffic

115. As per Section 9.4, an average of one cargo vessel and one tanker per day were recorded as intersecting the Wind Farm Area during the 28 days of marine traffic data studied, which was in line with data previously assessed.

116. However, based on experience at other UK wind farms, commercial vessels will typically avoid wind farm sites once construction is underway (i.e., from when the site is marked as a buoyed construction area). Any vessels that did still enter the Wind Farm Area would likely avoid the active works and by extension the 500m safety zones. Similarly, experience of other projects shows that once operational, commercial vessels will generally continue to avoid the commissioned structures therein, and consequently any major maintenance works and associated safety zones.

117. On this basis the 500m safety zones are not considered as having any additional impact on commercial vessels over that of the structures themselves.

118. The smaller 50m pre commissioning safety zones are considered as having no impact on commercial vessel transit given their radius, noting that it is considered extremely unlike that a commercial vessel would ever transit within 50m of a wind farm structure except in emergency circumstances.

11.2 Fishing Vessels

119. As per Section 9.4, notable levels of fishing activity were recorded in the study area, with the majority being demersal trawling occurring inshore (i.e., south, west, and south west) of the Wind Farm Area. Activity within the Wind Farm Area itself was limited. However, as is discussed in Section 9.4, the ongoing survey activity may be affecting fishing vessel behaviours in the area, and it is also noted that NnGOWL has agreements in place with fishing vessels in the area covering pre-construction geophysical surveys associated with the Project.

120. On this basis, it should be considered that fishing patterns may change as the works develop and the safety zones may therefore still impact upon active fishing within the Wind Farm Area. However, given that the number of active 500m safety zones active at any one time would be limited, the majority of the site would remain free for fishing activities or for fishing vessel transit. Similarly, the 50m pre-commissioning safety zones are unlikely to impede fishing activity, given their radius still leaves the majority of the site open for fishing.

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

11.3 Recreational Vessels

122. As per Section 9.6, recreational activity within the Wind Farm Area is limited based on the data sets studied, with the majority of recreational traffic instead remaining coastal, as is typical of such vessels. Two of the three recreational vessels recorded within the Wind Farm Area during the 2018/19 survey periods were small sailing vessels (the third could not be classified based on the available information), and such vessels are much better placed to manoeuvre than commercial vessels (see Section 9.4).

123. Regardless, the safety zones are not expected to have any notable impact on recreational vessels, given there will only ever be a limited number of 500m safety zones active at any given point, and the 50m radius of the pre-commissioning safety zones is such that transit through the Wind Farm Area would not be impeded whilst these zones were active.

11.4 Anchored Vessels

124. As per Section 9.7, anchoring activity in the area is limited based on the 2018/19 data, with only one vessel recorded at anchor over the 28 day period studied. It should be considered that past data, including that used for the 2016 validation exercise, has shown that tankers have historically anchored south of the Wind Farm Area, and it is not clear why this activity is not reflected in the 2018/19 data. Regardless, anchoring activity within the Wind Farm Area itself has always been observed to be limited.

125. Given the presence of the buoyed construction area, guard vessels in operation (where necessary), and the promulgation of work taking place in the area, it is considered unlikely that vessels would seek anchor within the Wind Farm Area except in an emergency (e.g., engine failure resulting in a vessel drifting towards construction vessels). Given these mitigations are in place in combination with the historical evidence that the Wind Farm Area is not used for anchoring, the safety zones are not anticipated as having any impact on vessels at anchor.

12 Promulgation, Monitoring and Policing

12.1 Promulgation of Information

127. The deployment of a safety zone shall be promulgated using standard marine procedures, including Notice to Mariners, Radio Warnings, Kingfisher bulletins and weekly Notice of Operations. NnGOWL will have regular contact with fishing stakeholders through Commercial Fisheries Working Group (CFWG) meetings and the company fisheries Liaison Officer (FLO). Details of any active safety zones will also be promulgated via VHF to passing traffic by the vessel assigned monitoring duties.

128. Further details of promulgation of information can be found in the Navigation Safety and Vessel Management Plan (NSVMP) (Doc Ref: NNG-NNG-ECF-PLN-0010), which will be made available by Marine Scotland once complete.

12.2 Monitoring

129. All vessels associated with the Project will be supplied with the safety zone procedures as summarised in this application.

130. 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 RAM).

131. Other on-site vessels will also be keeping a watch as required under Rule 5 of International Regulations for the Prevention of Collision at Sea (COLREGS) International Maritime Organization (IMO, 1972).

132. Where a third party vessel is observed to be approaching the Wind Farm Area, 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.

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

12.3 Policing

134. Where feasible, details and actions of any vessels which consistently ignore the warnings issued by NnGOWL via the designated on-site vessel, and /or are considered to be causing a potential danger to vessels (including themselves), 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 deemed as representing dangerous behaviour, unsafe navigational acts (as required under the relevant regulations implementing international conventions), or repeated entry will be reported to Marine Scotland and the MCA as the relevant authorities.

135. 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.

13 Summary

136. This document has presented a safety case demonstrating the need for safety zones to be implemented at the Neart na Gaoithe Offshore Wind Farm during the construction phase, and also during any periods of major maintenance in the operational phase. The followings safety zones are considered necessary, based on the findings of the NRA (Anatec, 2012) and this safety case:

- Mandatory "rolling" 500 metres (m) safety zones established around each wind farm structure (turbines 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 established around each wind farm structure (turbines and OSPs) and/or their foundations when construction works have been completed but prior to commissioning or where construction works have only been partially completed.
- Mandatory 500 m safety zones around all "major maintenance" work being undertaken, where major maintenance is as per the definition given in the Electricity Regulations 2007.

137. These safety zones are considered necessary on the basis that they will:

- Reduce the potential for collision risk;
- Reduce the potential for allision;
- Reduce the likelihood of passing traffic interacting with the anchor spread of construction / maintenance vessels;
- Protect persons engaged in the construction / maintenance process;
- Ensure personnel engaged in sensitive SOV operations involving WTW systems are protected when transferring, or stationed on the structure following transfer;
- Prevent behaviour considered as being dangerous;
- Assist third party vessels in passage planning;
- Reduce the likelihood of fishing vessel snagging risk;
- Provide an additional level of mitigation to account for inexperienced mariners; and
- Provide an additional level of mitigation to account for unforeseen risks.

138. The implementation of mandatory construction / major maintenance safety zones, in conjunction with other mitigation measures listed throughout this safety case shall ensure that the risks to both passing traffic and construction / maintenance vessels are within ALARP parameters. They will also ensure risks to project personnel are minimised.

139. The extent of the safety zones is considered to be balanced effectively with the level of traffic, noting that no significant impacts to shipping and navigation users arising from the safety zones have been identified.

140. The mandatory safety zones shall be monitored for infringements from third party vessels by an on-site vessel assigned with monitoring duties. The primary response will be to warn passing traffic of the ongoing works and any active safety zones, and to alert infringing vessels to an infringement by VHF radio. Records of all infringements shall be kept, and, if necessary, evidence passed to the relevant authorities for follow-up action if they deemed it appropriate.

14 References

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IALA (2013). International Association of Marine Aids to Navigation and Lighthouse Authorities Recommendations O-139: The Marking of Man-Made Offshore Structures, Edition 2. Saint Germain en Laye, France: IALA.

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

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MS-LOT (2018). Safety Zone Applications – SOP. Aberdeen: MS-LOT.

The Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996. Available at: http://www.legislation.gov.uk/uksi/1996/75/contents/made (accessed Sept 2019)

Appendix A Layout Coordinates

Table A.1 Layout Coordinates

Structure ID	Structure Type	Longitude	Latitude
NNG-H23	Turbine	002° 14.806' W	56° 19.943' N
NNG-H22	Turbine	002° 14.322' W	56° 19.488' N
NNG-H21	Turbine	002° 13.865' W	56° 19.043' N
NNG-G21	Turbine	002° 14.988' W	56° 18.873' N
NNG-F22	Turbine	002° 16.536' W	56° 18.785' N
NNG-H19	Turbine	002° 13.397' W	56° 18.588' N
NNG-D23	Turbine	002° 18.666' W	56° 18.572' N
NNG-H17	Turbine	002° 12.932' W	56° 18.134' N
NNG-D22	Turbine	002° 18.135' W	56° 18.127' N
NNG-H15	Turbine	002° 12.466' W	56° 17.677' N
NNG-B22	Turbine	002° 19.921' W	56° 17.623' N
NNG-F17	Turbine	002° 14.978' W	56° 17.394' N
NNG-E18	Turbine	002° 16.122' W	56° 17.324' N
NNG-H13	Turbine	002° 11.997' W	56° 17.214' N
NNG-C19	Turbine	002° 18.293' W	56° 17.155' N
NNG-G14	Turbine	002° 13.181' W	56° 17.095' N
NNG-B20	Turbine	002° 19.521' W	56° 17.097' N
NNG-E16	Turbine	002° 15.658' W	56° 16.874' N
NNG-H11	Turbine	002° 11.513' W	56° 16.740' N
NNG-C18	Turbine	002° 17.882' W	56° 16.725' N
NNG-G12	Turbine	002° 12.715' W	56° 16.640' N
NNG-F13	Turbine	002° 14.032' W	56° 16.498' N

Structure ID	Structure Type	Longitude	Latitude
NNG-A19	Turbine	002° 20.015' W	56° 16.490' N
NNG-D15	Turbine	002° 16.321' W	56° 16.376' N
NNG-H09	Turbine	002° 11.027' W	56° 16.263' N
NNG-G10	Turbine	002° 12.270' W	56° 16.197' N
NNG-E12	Turbine	002° 14.720' W	56° 16.029' N
NNG-D13	Turbine	002° 15.848' W	56° 15.946' N
NNG-C14	Turbine	002° 16.984' W	56° 15.858' N
NNG-H08	Turbine	002° 10.555' W	56° 15.808' N
NNG-A15	Turbine	002° 19.484' W	56° 15.474' N
NNG-H06	Turbine	002° 10.079' W	56° 15.324' N
NNG-G07	Turbine	002° 11.379' W	56° 15.279' N
NNG-F08	Turbine	002° 12.603' W	56° 15.198' N
NNG-A13	Turbine	002° 18.580' W	56° 15.153' N
NNG-B11	Turbine	002° 17.341' W	56° 14.989' N
NNG-F06	Turbine	002° 12.129' W	56° 14.751' N
NNG-A11	Turbine	002° 18.489' W	56° 14.668' N
NNG-G04	Turbine	002° 10.435' W	56° 14.405' N
NNG-F05	Turbine	002° 11.632' W	56° 14.330' N
NNG-D06	Turbine	002° 13.894' W	56° 14.179' N
NNG-A09	Turbine	002° 17.849' W	56° 14.153' N
NNG-B08	Turbine	002° 16.365' W	56° 14.109' N
NNG-C07	Turbine	002° 15.017' W	56° 14.076' N
NNG-D05	Turbine	002° 13.417' W	56° 13.744' N
NNG-B07	Turbine	002° 15.822' W	56° 13.695' N
NNG-A08	Turbine	002° 17.267' W	56° 13.665' N

Structure ID	Structure Type	Longitude	Latitude
NNG-G02	Turbine	002° 09.572' W	56° 13.520' N
NNG-A06	Turbine	002° 16.755' W	56° 13.248' N
NNG-E02	Turbine	002° 11.251' W	56° 12.829' N
NNG-D03	Turbine	002° 12.421' W	56° 12.828' N
NNG-F01	Turbine	002° 09.915' W	56° 12.790' N
NNG-A05	Turbine	002° 16.231' W	56° 12.822' N
NNG-B04	Turbine	002° 14.964' W	56° 12.817' N
NNG-OSP-N	OSP	002° 15.192' W	56° 16.446' N
NNG-OSP-S	OSP	002° 14.395' W	56° 14.615' N
NNG-B16	Spare	002° 18.487' W	56° 16.116' N
NNG-E20	Spare	002° 16.634' W	56° 17.76'0 N
NNG-E21	Spare	002° 17.142' W	56° 18.192' N
NNG-F11	Spare	002° 13.565' W	56° 16.092' N
NNG-F15	Spare	002° 14.512' W	56° 16.956' N
NNG-F19	Spare	002° 15.487' W	56° 17.826' N
NNG-G23	Spare	002° 15.792' W	56° 19.668' N