

Neart na Gaoithe Offshore Wind Farm

Lighting and Marking Plan

December 2019

Rev 3.0

DOCUMENT REFERENCE: NNG-NNG-ECF-PLN-0009

Neart na Gaoithe Offshore Wind Farm Lighting and Marking Plan

Pursuant to Section 36 Consent Condition 20 and the Marine Licence (Offshore
Transmission Works) Condition 3.2.2.19

For the approval of the Scottish Ministers

Document Control

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Plan Overview

Purpose and Objectives of the Plan

This Lighting and Marking Plan (LMP) has been prepared to address the specific requirements of the relevant conditions attached to the Section 36 (S36) consent and Marine Licences issued to Neart na Gaoithe Offshore Wind Limited (NnGOWL).

The LMP, in line with the requirements of Section 36 and Marine Licence conditions, and in line with industry standards and good practice, is designed to provide details of the aviation and marine navigation lighting and marking during both the construction and operational phases of the Project.

All NnGOWL personnel and Contractors involved in the Project must comply with this LMP.

Scope of the Plan

The LMP covers the following:

- Promulgation of information to aviation stakeholders during the construction phase;
- Aviation lighting and marking during the operational phase;
- Marine lighting and marking during the construction phase; and
- Marine lighting and marking during the operational phase.

Structure of the Plan

The LMP is structured as follows:

Sections 1 to 3 sets out the scope and objectives of the LMP, details the process for making updates and amendments to this document, sets out broad statements of compliance and provides an overview of the Project.

Section 4 provides an overview of the aviation lighting and marking to be implemented during the construction and operational phases of the Project.

Section 5 provides an overview of the marine lighting and marking to be implemented during the construction and operational phases of the Project.

Section 6 summarises how the LMP has been drafted in compliance with the Environmental Impact Assessment (EIA) Report and the Addendum of Supplementary Information (the Addendum).

Appendix A details the relevant guidance and legislation that has been considered during the drafting of this LMP.

Appendix B provides full details as to how the LMP is compliant with the parameters assessed within the EIA Report and the Addendum.

Appendix C details any mitigation measures pertinent to lighting and marking that were included within the EIA Report and the Addendum, and references where in this LMP each measure has been addressed.

Plan Audience

The LMP is intended to be referred to by personnel involved in the construction of the Project, including NnGOWL personnel and Contractors.

Compliance with this LMP will be monitored by the NnGOWL Consents and Environment Team (CET), NnGOWL's Environmental Clerk of Works (ECOW), and the Marine Scotland Licensing and Operations Team (MS-LOT).

Plan Locations

Copies of this LMP are to be held in the following locations:

- NnGOWL Project Office;
- At the premises of any agent or Contractor acting on behalf of NnGOWL;
- All site offices dealing with offshore operations, including the Marine Coordination Centre; and
- With NnGOWL's ECOW.

Contents

1	Introduction	12
1.1	Background.....	12
1.2	Objectives of this Document	12
1.3	Linkages with other Consent Plans.....	18
1.4	LMP Document Structure	19
2	NnGOWL Statements of Compliance	21
2.1	Introduction.....	21
2.2	Statements of Compliance	21
3	Project Overview.....	22
3.1	Timing of Construction Works	22
3.2	Project Layout	22
4	Aviation Lighting and Marking	25
4.1	Introduction.....	25
4.2	Aviation Lighting and Marking – Construction	25
4.3	Aviation Lighting and Marking – Operation.....	25
4.4	Aviation Lighting – Emergency Reporting.....	30
5	Marine Navigation Lighting and Marking.....	32
5.1	Introduction.....	32
5.2	Promulgation of Information.....	32
5.3	Statutory Sanction.....	32
5.4	Marine Navigational Lighting and Marking – Construction	32
5.5	Marine Navigation Lighting and Marking – Operation	35
5.6	Failure of Construction Buoyage or Operational Marine Navigation Lighting and Marking.....	40
5.7	Additional Lighting not required by the Conditions	40
6	Compliance with the Application	41
6.1	Compliance with the Application and supporting information	41
6.2	Delivery of Mitigation proposed in the Application and supporting information	41
7	References	42
Appendix A	Legislation, Guidance, and Policy	43
A.1	Marine Navigation.....	43
A.2	Aviation & DIO.....	43
A.3	Emergency Response.....	43
Appendix B	Compliance with Lighting and Marking assessed in the Application	44
Appendix C	Application Commitments.....	46

Figures

Figure 3-1: Project Overview	23
Figure 3-2: Project Layout with Structure ID System	24
Figure 4-1: Aviation Lighting – Operational	27
Figure 4-2: Example Blade Hover Reference Marks	29
Figure 5-1: Construction Buoyage	34
Figure 5-2: Marine Lighting – Operation	37
Figure 5-3: AIS Overview	39

Tables

Table 1-1: Consent conditions to be discharged by this LMP	12
Table 1-2: Other consent conditions relevant to this LMP	13
Table 1-3: LMP consistency and links to other Consent Plans	18
Table 1-4: LMP document structure	19
Table 4-1: Aviation Lighting Summary	28
Table 5-1: Construction Buoyage Positions	35
Table 5-2: Operational Lighting Summary (Marine)	38

Acronyms and Abbreviations

TERM	DESCRIPTION
AIRAC	Aeronautical Information Regulation and Control
AIP	Aeronautical Information Publication
AIS	Automatic Identification System
ANO	Air Navigation Order
AtoN	Aid to Navigation
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CET	Consents and Environment Team
COLREGs	International Regulations for Preventing Collisions at Sea
DGC	Defence Geographic Centre
DIO	Defence Infrastructure Organisation
ECoW	Ecological Clerk of Works
ES	Environmental Statement
FI	Flash
HAT	Highest Astronomical Tide
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ID	Identification
IPS	Intermediate Periphery Structure
km	Kilometre(s)
kV	Kilovolt(s)
L	Long
LAT	Lowest Astronomical Tide
m	Metres
MCA	Maritime and Coastguard Agency

TERM	DESCRIPTION
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MOD	Ministry of Defence
MS-LOT	Marine Scotland Licensing Operations Team
MW	Megawatt(s)
NLB	Northern Lighthouse Board
nm	Nautical mile(s)
NnGOWL	Neart na Gaoithe Offshore Wind Limited.
NOTAM	Notice to Airmen
NVIS	Night Vision Imaging System
O&M	Operations and Maintenance
Ofcom	Office of Communications
OfTW	Offshore Transmission Works
OREI	Offshore Renewable Energy Installation.
OSP	Offshore Substation Platform
Q	Quick
s	Second
SAR	Search and Rescue.
SFF	Scottish Fishermen's Federation
SNH	Scottish Natural Heritage
SPS	Significant Periphery Structure
UKAIS	UK Aeronautical Information Service
UKHO	United Kingdom Hydrographic Office
WTG	Wind Turbine Generator
Y	Yellow

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). NnGOWL has been established to develop, finance, construct, operate, maintain and decommission the Project.
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 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.
OnTW	The onshore transmission works from landfall and above Mean High Water Springs, consisting of onshore export cables and the onshore substation.

TERM	DESCRIPTION
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

CONSENT PLAN	ABBREVIATION	DOCUMENT REFERENCE NUMBER
Decommissioning Programme	DP	NNG-NNG-ECF-PLN-0016
Construction Programme and Construction Method Statement	CoP and CMS	NNG-NNG-ECF-PLN-0002
Piling Strategy	PS	NNG-NNG-ECF-PLN-0011
Development Specification and Layout Plan	DSLP	NNG-NNG-ECF-PLN-0003
Design Statement	DS	NNG-NNG-ECF-PLN-0004
Environmental Management Plan	EMP	NNG-NNG-ECF-PLN-0006
Operation and Maintenance Programme	OMP	NNG-NNG-ECF-PLN-0012
Navigational Safety Plan and Vessel Management Plan	NSP and VMP	NNG-NNG-ECF-PLN-0010
Emergency Response Cooperation Plan	ERCoP	NNG-NNG-ECF-PLN-0015
Cable Plan	CaP	NNG-NNG-ECF-PLN-0007
Lighting and Marking Plan	LMP	NNG-NNG-ECF-PLN-0009
Project Environmental Monitoring Programme	PEMP	NNG-NNG-ECF-PLN-0013
Fisheries Management and Mitigation Strategy	FMMS	NNG-NNG-ECF-PLN-0008
Marine Archaeological Reporting Protocol	MARP	NNG-NNG-ECF-PLN-0005
Construction Traffic Management Plan	CTMP	NNG-NNG-ECF-PLN-0014

1 Introduction

1.1 Background

1. The Neart na Gaoithe Offshore Wind Farm (Revised Design) received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 03 December 2018 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 S36 consent and Wind Farm Marine Licence were revised by issue of a variation to the S36 Consent and Marine Licence 06677/19/0 on 4 June 2019, and the OfTW Marine Licence by the issue of Marine Licence 06678/19/1 on the 5 June 2019. The revised 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. The S36 Consent and Marine Licences contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of any offshore construction works. One such requirement is the approval of a Lighting and Marking Plan (LMP), the purpose of which is to detail the lighting and marking of the Project to be implemented during its construction and operational phases. The relevant conditions setting out the requirements for an LMP for approval, and which are to be discharged by this LMP, are presented in full in Table 1-1.
4. In addition to the specific consent requirements for an LMP and the requirements thereof (as set out in Table 1-1), this LMP also includes information in respect of a number of other consents conditions which are linked to the matter of lighting and marking; these are set out in Table 1-2 which includes reference to where matters are addressed in this LMP.

Table 1-1: Consent conditions to be discharged by this LMP

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
Section 36 Consent Condition 20	The Company must, no later than six months prior to the Commencement of the Development, submit a Lighting and Marking Plan (LMP), in writing, to the Scottish Ministers for their written approval.	This document sets out the LMP for approval by the Scottish Ministers.
	Such approval may only be granted following consultation by the Scottish Ministers with Scottish Natural Heritage (SNH), Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), Civil Aviation Authority (CAA), Ministry of Defence (MOD), Scottish Fishermen’s Federation (SFF), Angus Council, Dundee City Council, East Lothian Council, Fife Council, Scottish Borders Council and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers.
	The LMP must provide that the Development be lit and marked in accordance with the current CAA and MOD aviation lighting policy and guidance that is in place as at the date of the Scottish Ministers approval of the LMP, or any such other documents that may supersede this guidance prior to the approval of the LMP.	As per Appendix A, all relevant CAA and MOD guidance has been considered within this LMP.

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
	The LMP must also detail the navigational lighting requirements detailed in International Association of Marine Aids to Navigation and Lighthouse Authorities ("IALA") Recommendation O-139 or any other documents that may supersede this guidance prior to approval of the LMP.	As per Appendix A, this LMP is compliant with the requirements of IALA O-139.
OfTW Marine Licence Conditions 3.2.2.19	The Licensee must, no later than six months prior to the Commencement of the Works, submit a Lighting and Marking Plan ("LMP"), in writing, to the Licensing Authority for their written approval.	This document sets out the LMP for approval by the Scottish Ministers.
	Such approval may only be granted following consultation by the Licensing Authority with SNH, MCA, NLB, CAA, MOD, SFF, Angus Council, Dundee City Council, East Lothian Council, Fife Council, Scottish Borders Council and any such other advisors or organisations as may be required at the discretion of the Licensing Authority. Commencement of the Works may not take place until such approval is granted.	Consultation to be undertaken by the Scottish Ministers.
	The LMP must provide that the Works be lit and marked in accordance with the current CAA and MOD aviation lighting policy and guidance that is in place as at the date of the Licensing Authority approval of the LMP, or any such other documents that may supersede this guidance prior to the approval of the LMP.	As per Appendix A, all relevant CAA and MOD guidance has been considered within this LMP.
	The LMP must also detail the navigational lighting requirements detailed in the International Association of Marine Aids to Navigation and Lighthouse Authorities ("IALA") Recommendation O-139 or any other documents that may supersede this guidance prior to approval of the LMP.	As per Appendix A, this LMP is compliant with the requirements of IALA O-139.

Table 1-2: Other consent conditions relevant to this LMP

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
Section 36 Consent Condition 22	The Company must, prior to the Commencement of the Development, and following confirmation of the approved Development Specification and Layout Plan ("DSL") by the Scottish Ministers (refer to Condition 12), provide the positions and maximum heights of the WTGs, and construction equipment to the Defence Geographic Centre ("DGC") and United Kingdom Hydrographic Office ("UKHO") for aviation and nautical charting purposes. The Company must, within one month of the Final Commissioning of the Development, provide the coordinates accurate to three decimal places of minutes of arc for each WTG, position and maximum heights of the WTGs to the DGC and UKHO for aviation and nautical charting purposes.	See Section 5.2.
Wind Farm Marine Licence Condition 3.2.2.2	The Licensee must, prior to the Commencement of the Works, provide the positions and maximum heights of any WTG and construction equipment to the	See Section 4.2 and Section 5.2.

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
	United Kingdom Hydrographic Office ("UKHO"), for nautical charting purposes, and to the Defence Geographic Centre ("DGC"), for aviation purposes.	
OfTW Marine Licence Condition 3.2.2.4	<p>The Licensee must, no later than one calendar month prior to Commencement of the Works, notify the United Kingdom Hydrographic Office ("UKHO") of the proposed works to facilitate the promulgation of maritime safety information and updating of admiralty charts and publications through the national Notice to Mariners system.</p> <p>The Licensee must, no later than one calendar month prior to Commencement of the Works, and following confirmation of the approved DSLP by the Licensing Authority (refer to condition 3.2.2.17), provide the positions and maximum heights of the OSPs and construction equipment to the UKHO and Defence Geographic Centre ("DGC") for aviation and nautical charting purposes.</p> <p>The Licensee must, no later than one calendar month prior to Commencement of the Works, ensure that local mariner's organisations and local fishermen's organisations and HM Coastguard are made fully aware of the Works through local Notice to Mariners or by any other appropriate means.</p> <p>The Licensee must ensure that details of the Licensed Activities are promulgated in the Kingfisher Fortnightly Bulletin, no later than one calendar month prior to the Commencement of the Works to inform the commercial fishing industry of the vessel routes and the timing and location of the construction activities.</p>	Promulgation of information to marine stakeholders is summarised in Section 5.2.
	The Licensee must, no later than eight weeks prior to the Commencement of the Works, complete an "Application for Statutory Sanction to Alter/Exhibit" form and submit this to the Northern Lighthouse Board ("NLB") for the necessary sanction to be granted.	See Section 5.3, which states NnGOWL will apply for statutory sanction to alter/exhibit/remove all AtoN that are exhibited for at least six months.
Wind Farm Marine Licence Condition 3.2.2.5	<p>The Licensee must, no later than one calendar month prior to Commencement of the Works, notify the UKHO of the proposed works to facilitate the promulgation of maritime safety information and updating of admiralty charts and publications through the national Notice to Mariners system.</p> <p>The Licensee must, no later than one calendar month prior to Commencement of the Works, ensure that local mariner's organisations and local fishermen's organisations and HM Coastguard are made fully aware of the Works through local Notice to Mariners or by any other appropriate means.</p> <p>The Licensee must ensure that details of the Licensed Activities are promulgated in the Kingfisher Fortnightly Bulletin, no later than one calendar month prior to the Commencement of the Works to inform the commercial fishing industry of the vessel routes and the timing and location of the construction activities.</p>	Promulgation of information to marine stakeholders is summarised in Section 5.2.
	The Licensee must, no later than eight weeks prior to the Commencement of the Works, complete an "Application for Statutory Sanction to Alter/Exhibit" form	See Section 5.3, which states NnGOWL will apply

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
	and submit this to the Northern Lighthouse Board ("NLB") for the necessary sanction to be granted.	for statutory sanction to alter/exhibit/remove all AtoN that are exhibited for at least six months.
OfTW Marine Licence Condition 3.2.3.2 and Wind Farm Marine Licence Condition 3.2.3.2	The Licensee must notify the UKHO of the progress of the construction of the Works to facilitate the promulgation of maritime safety information and updating of admiralty charts and publications through the national Notice to Mariners system.	See Section 5.2.
	The Licensee must ensure that progress of the Works is promulgated regularly in the Kingfisher Fortnightly Bulletin to inform the commercial fishing industry of the vessel routes and the timing and location of the construction activities.	
	The Licensee must in the case of damage to, or destruction or decay of, the Works, notify the Licensing Authority, in writing, as soon as reasonably practicable, following such damage, destruction or decay. The Licensee must carry out any remedial action as required by the Licensing Authority, following consultation with the MCA, the NLB or any such advisers as required by the Licensing Authority.	Emergency reporting procedures in relation to AtoNs are summarised in Section 4.4 (aviation) and Section 5.6 (marine).
	The Licensee must ensure that any vessels permitted to engage in the construction of the Works are marked in accordance with the International Rules for the Prevention of Collisions at Sea ("COLREGs") whilst under way, and in accordance with the UK Standard Marking Schedule for Offshore Installations if the vessel is secured to the seabed.	See Section 5.4.3.
	The Licensee must ensure that no radio beacon or radar beacon operating in the marine frequency bands is installed or used on the Works without the prior written approval of the Office of Communications ("Ofcom").	NnGOWL will apply to Ofcom for the appropriate AIS (Automatic Identification System) licences as per Sections 5.4.2 and 5.5.4
OfTW Marine Licence Conditions 3.2.3.3 and 3.2.4.5	The Licensee must ensure that the Works are marked and lit in accordance with an approved LMP at all times.	See relevant statement of compliance in Section 2.2.
	The LMP and any subsequent amendments must be approved by the Licensing Authority following consultation with the NLB, MCA, CAA and the MOD.	Consultation on this LMP will be undertaken by the Scottish Ministers.
	The display of unauthorised marks or lights is prohibited.	See Section 5.3, which states

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
		NnGOWL will apply for statutory sanction to alter/exhibit/remove all Aids to Navigation (AtoNS) that are exhibited for at least six months.
	The Licensee must ensure that the Works are marked and lit in accordance with IALA Recommendation O-139.	As per Appendix A, this LMP is compliant with the requirements of IALA O-139.
Wind Farm Marine Licence Conditions 3.2.3.3 and 3.2.4.5	The Licensee must ensure that the Works are marked and lit in accordance with an approved LMP at all times.	See relevant statement of compliance in Section 2.2.
	The LMP and any subsequent amendments must be approved by the Licensing Authority following consultation with the NLB, MCA, CAA and the MOD.	Consultation on this LMP will be undertaken by the Scottish Ministers.
	The display of unauthorised marks or lights is prohibited.	See Section 5.3, which states NnGOWL will apply for statutory sanction to alter/exhibit/remove all AtoN that are exhibited for at least six months.
	The Licensee must ensure that the Works are marked and lit in accordance with IALA Recommendation O-139.	As per Appendix A, this LMP is compliant with the requirements of IALA O-139.
	Unless otherwise approved by the Licensing Authority, the LMP must include but not be limited to: <ul style="list-style-type: none"> a. the lighting requirements of the MCA, NLB, CAA and MOD; b. that the boundary Wind Turbine Generator (WTG), where they are more than 900m apart, must be lit with a single 2000 candela, red aviation light, flashing Morse 'W' in unison with all other boundary WTGs; 	<ul style="list-style-type: none"> a. See Appendix A b. See Section 4.3.1 c. See Section 4.3.1 d. See Section 4.3.1

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
	<p>c. that all other WTG must be fitted with a fixed single red 200 candela aviation light for Search and Rescue (SAR) purposes; and</p> <p>d. that all WTG aviation lights should be compatible with Night Vision Imaging Systems (NVIS).</p>	
OfTW Marine Licence Condition 3.2.4.4 and Wind Farm Marine Licence Condition 3.2.4.4 (Partial)	<p>The Licensee must notify the UKHO of the Completion of the Works to facilitate the promulgation of maritime safety information and updating of Admiralty Charts and publications through the national Notice to Mariners system.</p> <p>The Licensee must, within one month of the Completion of the Works, provide the “as-built” positions and maximum heights of all OSP/WTG along with any sub-sea infrastructure, to the DGC and the UKHO for aviation and nautical charting purposes.</p> <p>The Licensee must ensure that local mariners, fishermen’s organisations and HM Coastguard, in this case the National Maritime Coastguard Centre are made fully aware of the Completion of the Works.</p> <p>The Licensee must ensure that the Completion of the Works is promulgated in the Kingfisher Fortnightly Bulletin to inform the commercial fishing industry.</p>	<p>Promulgation of information is covered in Section 5.2 (marine) and Section 4.2 (aviation).</p>
	<p>The Licensee must ensure that no radio beacon or radar beacon operating in the marine frequency bands is installed or used on the Works without the prior written approval of Ofcom.</p>	<p>NnGOWL will apply to Ofcom for the appropriate AIS licences as per Sections 5.4.2 and 5.5.4.</p>
	<p>The Licensee must not exhibit, alter or discontinue navigational lighting of the Works without the statutory sanction of the Commissioners of Northern Lighthouses. An ‘Application for Statutory Sanction to Exhibit/Discontinue’ form must be completed by the Licensee as fully as possible and returned to the NLB for the necessary sanction to be granted prior to exhibiting, altering or discontinuing navigational lighting.</p>	<p>See Section 5.3, which states NnGOWL will apply for statutory sanction to alter/exhibit/remove all AtoN that are exhibited for at least six months.</p>
	<p>The Licensee must, where any damage, destruction or decay is caused to the Works, notify the Licensing Authority, in writing, of such damage, destruction or decay as soon as reasonably practicable following such damage, destruction or decay. The Licensee must carry out any remedial action which the Licensing Authority advises the Licensee, in writing, as requiring to be taken, which may include a requirement to display aids to navigation, following consultation by the Licensing Authority with the MCA, the NLB or any such advisers as required.</p> <p>The Licensee must ensure that the Works are actively monitored during the operation and maintenance phases. The Licensee must ensure that a contingency plan is in place to respond to any reported catastrophic failures which may result in the Works, or part(s) of the Works, breaking loose and becoming a buoyant hazard. This contingency plan should include the transmission of local radio navigation warnings.</p>	<p>Emergency reporting procedures in relation to AtoNs are summarised in Section 4.4 (aviation) and Section 5.6 (marine).</p>

OFFSHORE CONSENTS REFERENCE	CONDITION	WHERE ADDRESSED
OfTW Marine Licence Condition 3.2.4.8 and Wind Farm Marine Licence Condition 3.2.4.8	The Licensee must, within one month of the final Completion of the Works, provide the coordinates accurate to three decimal places of minutes of arc for each OSP/WTG, position and maximum heights of the OSP/WTG to UKHO and the DGC for nautical charting and aviation purposes.	See Section 5.2

1.3 Linkages with other Consent Plans

- This LMP sets out the lighting and marking that will be utilised during the construction and operational phases of the wind farm. However, ultimately it forms part of a suite of approved documents that provide the framework for environmental management of the Project– namely the other Consent Plans required under the consents.
- The linkage between this LMP and other Consent Plans is summarised in Table 1.3.

Table 1-3: LMP consistency and links to other Consent Plans

OFFSHORE CONSENT REFERENCE	CONSENT PLAN	CONSISTENCY WITH AND LINKAGES TO LMP
<p>Section 36 Consent Condition 15</p> <p>OfTW Marine Licence Condition 3.2.2.11</p> <p>Wind Farm Marine Licence Condition 3.2.2.12</p> <p>Section 36 Consent Condition 17</p> <p>OfTW Marine Licence Condition 3.2.2.12</p>	<p>Navigational Safety Plan and Vessel Management (NSVMP)</p>	<p>The NSVMP considers the management and coordination of vessels and presents the measures that will be put in place to manage navigational safety.</p> <p>The NSVMP must be, so far as is reasonably practicable, consistent with the LMP.</p>
<p>Section 36 Consent Condition 18</p> <p>OfTW Marine Licence Condition 3.2.2.6</p> <p>Wind Farm Marine Licence Condition 3.2.2.7</p>	<p>Emergency Response Cooperation Plan (ERCoP)</p>	<p>The ERCoP details how emergency response procedures will be implemented in cooperation with the relevant bodies.</p> <p>It is noted that the relevant conditions do not explicitly state a required linkage between the ERCoP and LMP, however there is overlap between these plans and as such they will be consistent as far as is reasonably practicable.</p>
<p>Section 36 Consent Condition 10</p> <p>OfTW Marine Licence Condition 3.2.2.7</p>	<p>Construction Method Statement (CMS)</p>	<p>The purpose of the CMS is to detail the methods that will be implemented during the construction phase. The CMS is, so far as is reasonably practicable, consistent with the LMP as required under the relevant conditions.</p>

OFFSHORE CONSENT REFERENCE	CONSENT PLAN	CONSISTENCY WITH AND LINKAGES TO LMP
Wind Farm Marine Licence Condition 3.2.2.8		
Section 36 Consent Condition 12 OfTW Marine Licence Condition 3.2.2.17	Development Specification and Layout Plan (DSLPL)	The DSLP details the final layout and associated parameters (including lighting and marking). The DSLP is, so far as is reasonably practicable, consistent with the LMP.
Section 36 Consent Condition 16 OfTW Marine Licence Condition 3.2.2.16	Operation and Maintenance Programme (OMP)	The OMP sets out the procedures and good working practices for the operational and maintenance (O&M) phase of the Development. The OMP must be, so far as is reasonably practicable, consistent with the LMP.

1.4 LMP Document Structure

7. An overview of the structure of this LMP is provided below.

Table 1-4: LMP document structure

SECTION		SUMMARY OF CONTENT
1	Introduction	Background to consent requirements and overview of the LMP scope and structure; Identifies those other Consent Plans relevant to the environmental management process and the linkage between those plans and the LMP; and, Sets out the procedures for any required updating or amending the approved LMP and subsequent further approval by the Scottish Ministers.
2	NnGOWL Statements of Compliance	Sets out the NnGOWL statements of compliance in relation to the LMP consents conditions.
3	Project Overview	Provides an overview of the Project.
4	Aviation Lighting and Marking	Details the lighting and marking relevant to aviation.
5	Marine Lighting and Marking	Details the marine lighting and marking.
6	Compliance with the Application, ES, and Addendum	Summarises how the LMP has been drafted in compliance with the Application.
7	References	Provides sources referenced within this LMP.
Appendix A	Legislation, Guidance, and Policy	Details the relevant guidance and legislation that has been considered during the drafting of this LMP.

SECTION		SUMMARY OF CONTENT
Appendix B	Compliance with Lighting and Marking assessed in the Application	Provides full details as to how the LMP is compliant with the parameters assessed within the Application.
Appendix C	Application Commitments	Details any mitigation measures pertinent to lighting and marking that were included within the Application and references where in this LMP each measure has been addressed.

2 NnGOWL Statements of Compliance

2.1 Introduction

8. The following section is intended to re-affirm the overarching NnGOWL commitments relating to lighting and marking of the Project in such a manner as to meet the relevant requirements set out by the consents but also broader legislative requirements in respect of the guidance set out by the relevant bodies.

2.2 Statements of Compliance

9. NnGOWL in undertaking the construction and operation of the Project will require compliance with this LMP as approved by the Scottish Ministers (and as updated or amended from time to time).
10. Where updates or amendments to this LMP are required, NnGOWL will ensure the Scottish Ministers are informed as soon as reasonably practicable and where necessary the LMP will be updated and amended.
11. NnGOWL in undertaking the construction and operation of the Project will ensure compliance with the limits defined by the Application (unless otherwise approved in advance by the Scottish Ministers / the Licensing Authority) (see Appendix B).
12. NnGOWL will comply - and ensure that NnGOWL contractors comply - with the requirements of relevant environmental and maritime legislation as standard. A register of legislation, policy and guidance with which this LMP complies is presented in Appendix A.

3 Project Overview

13. The Wind Farm Area is located to the northeast of the Firth of Forth, 15.5 km directly east of Fife Ness on the east coast of Scotland (see Figure 3-1). The Wind Farm Area covers approximately 105 km². 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. Figure 3-1 shows the Wind Farm Area and Offshore Export Cable Corridor.
14. 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 66kV 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.

3.1 Timing of Construction Works

15. It is currently anticipated that offshore construction will commence in Quarter 2 (Q2) 2020. Details of the construction programme are provided in the NnGOWL Construction Programme and Construction Method Statement (CoP and CMS).

3.2 Project Layout

16. The Project layout is given in Figure 3-2. For the purpose of context within this LMP, the final structure ID marking system is included in Figure 3-2.

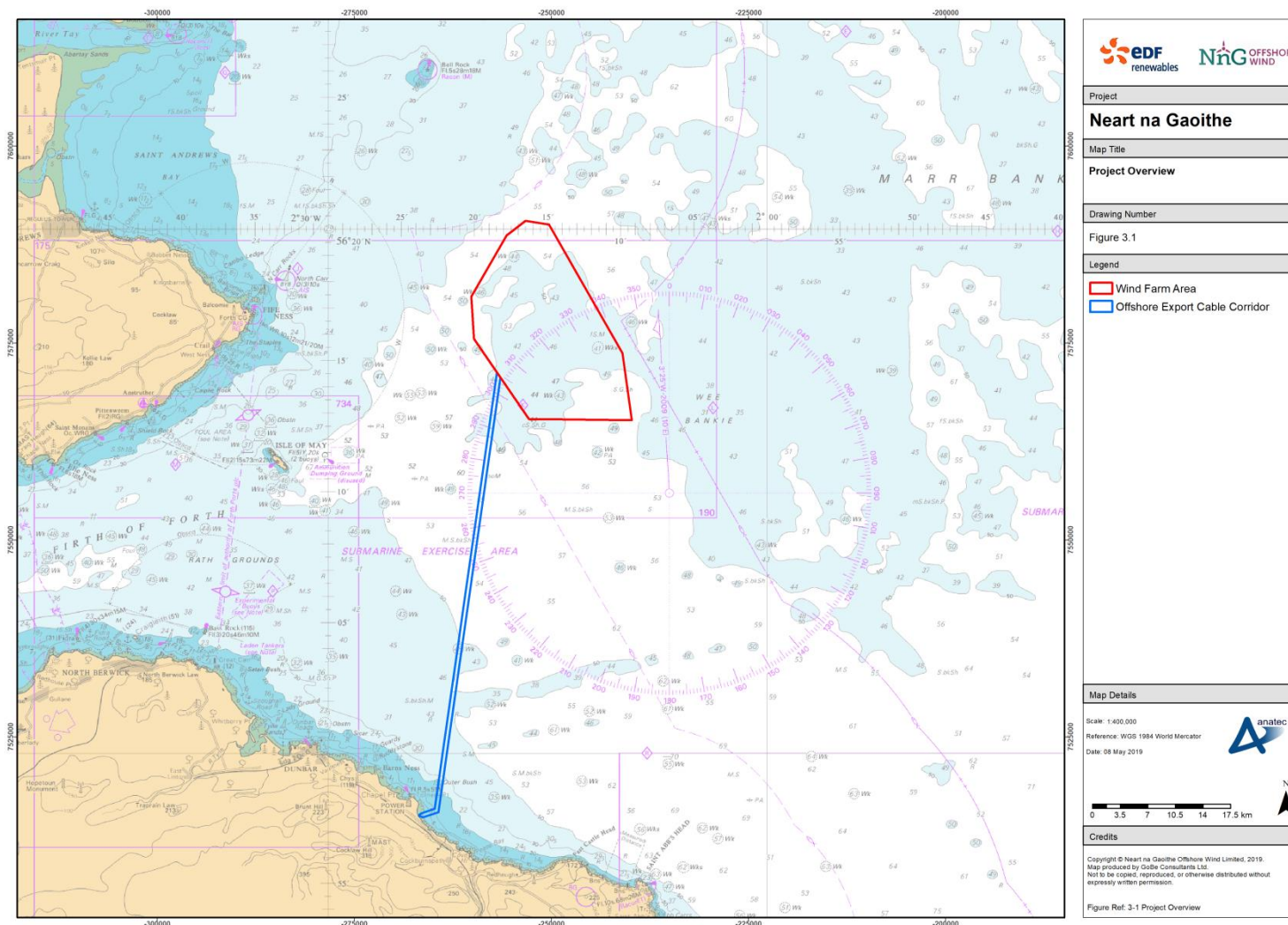


Figure 3-1: Project Overview

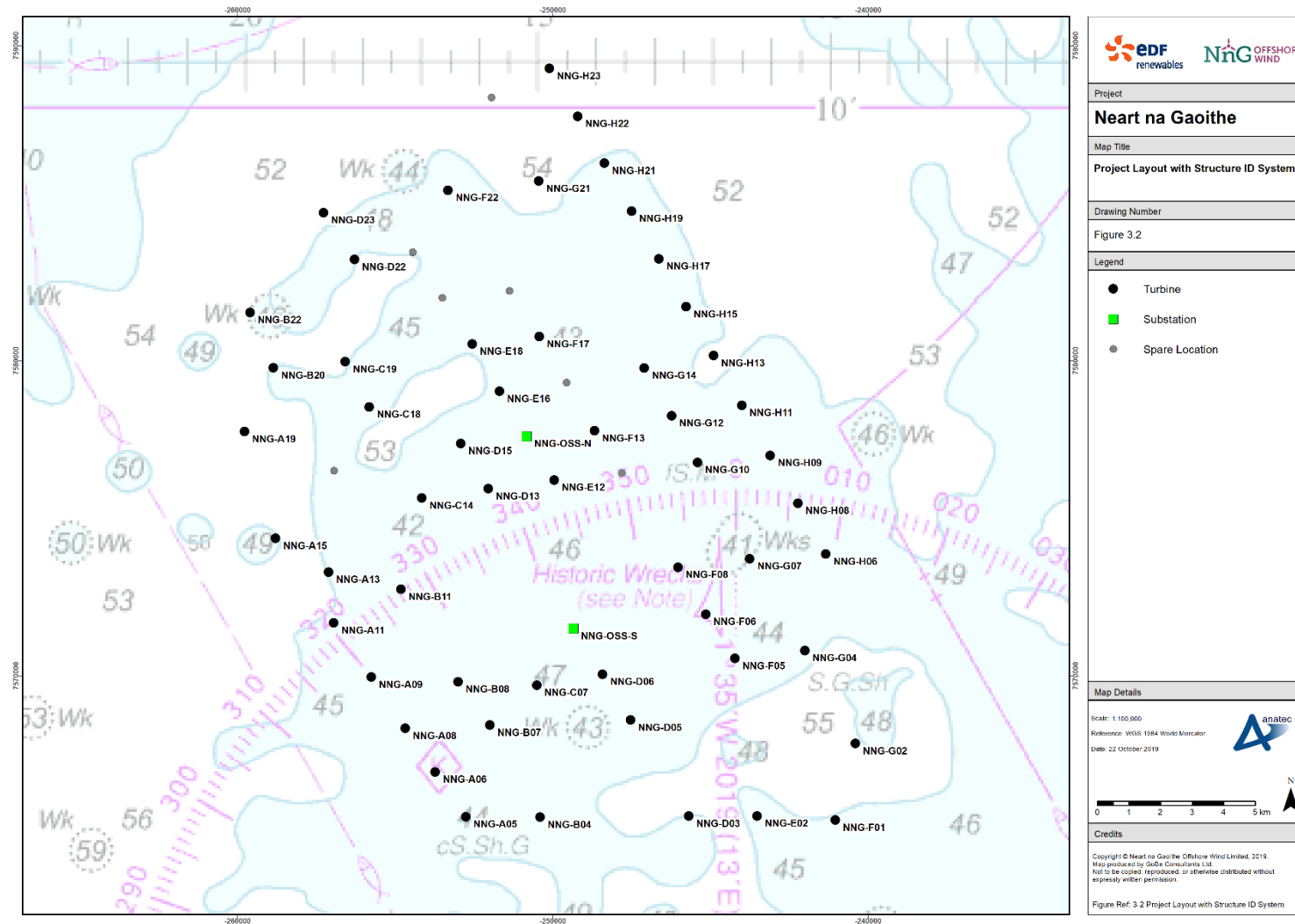


Figure 3-2: Project Layout with Structure ID System

4 Aviation Lighting and Marking

4.1 Introduction

17. This section sets out the aviation lighting and marking arrangements for the Project, including lighting and marking technical specifications.
18. The aviation lighting and marking has been designed to be compliant with the current CAA and Defence Infrastructure Organisation (DIO) requirements for offshore wind farm structures (as set out in Appendix A). The relevant guidance is set out in relation to each of the specific lighting and marking elements in the following sections.

4.2 Aviation Lighting and Marking – Construction

19. It is not intended that aviation lighting or marking will be active until commissioning of the Project. Therefore, NnGOWL provides a commitment to the effective promulgation of information to the appropriate aviation authorities through the construction phase. The method of promulgation is detailed below to ensure that any unmarked hazards during the construction phase are identified and included within aviation warnings.
20. There is an international civil aviation requirement for all structures (temporary or otherwise) of 300 feet (91.4 metres (m)) or more to be charted on aeronautical charts. Locations for the Project will be reported to the DGC which maintains the UK's data base of tall structures (the Digital Vertical Obstruction File) at least 10 weeks prior to the construction of any such structure. The point of contact for the DGC is: 0208 818 2702, mail to dvof@mod.uk.
21. As per CAA requirements, NnGOWL will provide the DGC with accurate location of the turbines, maximum heights, the lighting status of the turbines and the estimated start / end dates for construction together with the estimate of when the turbines are scheduled to be removed.
22. In order to ensure that aviation stakeholders are aware of any structures or large construction vessels that exceed 196 feet (60 m), stakeholders shall be notified through the means of a Notice to Airmen (NOTAM). To arrange an associated NOTAM, NnGOWL will contact the CAA's Airspace Regulation (0207 453 6599, mail to AROps@caa.co.uk); providing the same information as required by the DGC at least 14 days prior to the start of construction (noting the differing 60 m requirement).
23. It is noted there will not be any red aviation hazard lights (or any specific aviation lighting) prior to the designated peripheral turbines being commissioned, as noted in Section 4.3.

4.3 Aviation Lighting and Marking – Operation

24. The aviation lighting for the Project during the operational phase has been designed to be compliant with the relevant requirements set out in the following guidance and policy documents:
 - CAA Publication (CAP) 393 Air Navigation: The Order and Regulations Article 222 (CAA, 2016);
 - CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016);
 - CAA CAP 437 - Standards for offshore helicopter landing areas (CAA, 2018);
 - MCA Marine Guidance Notice (MGN) 543 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016); and

- MCA OREI ERCoP for Construction and Operation Phase, and Requirements for Emergency Response and SAR Helicopter Operations (MCA, 2019).

4.3.1 Lighting

25. All peripheral structures (where their height exceeds 60m) will have a medium intensity red light mounted on the top of the nacelle (or highest fixed point) during the operational phase following commissioning in accordance with Air Navigation Order (ANO) Article 221. As per Condition 3.2.3.3 of the Wind Farm Marine Licence, and in line with standard marine practice and NLB preference, the medium intensity red lights will flash Morse 'W'. Where a spare location is used on the periphery of the Wind Farm array, this turbine will also be fitted with a medium intensity red light that will flash Morse 'W'.
26. All other internal structures will also have a low intensity search and rescue (SAR) light. During routine operations these lights shall be switched off. The lights may be required to be switched on at the request of the SAR coordination authority and / or a SAR helicopter or aircraft during a SAR event. It should be noted that the aviation warning light on peripheral turbines will be configured to also fulfil the SAR light role (intensity adjustable) when required. On this basis, all aviation lights signals will be remotely operable via the central control system.
27. The aviation lighting plan is presented in Figure 4-1 and summarised in Table 4-1.

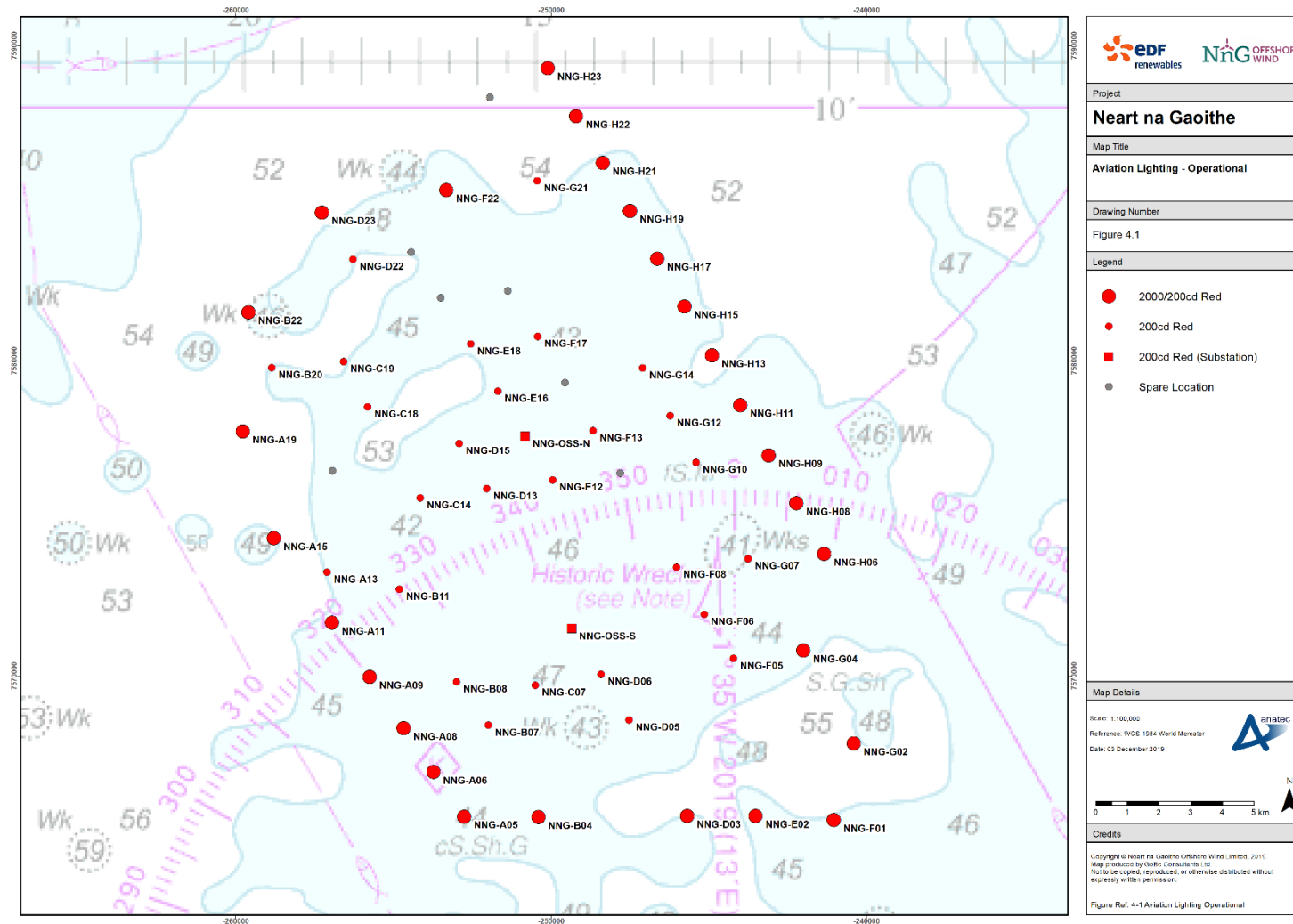


Figure 4-1: Aviation Lighting – Operational

Table 4-1: Aviation Lighting Summary

STRUCTURE	SPECIFICATION
Peripheral Structures A05, A06, A08, A09, A11, A15, A19, B04, B22, D03, D23, E02, F01, F22, G02, G04, H06, H08, H09, H11, H13, H15, H17, H19, H21, H22, H23	Aviation Warning Light: <ul style="list-style-type: none"> Red medium intensity (2,000 candela). 360° visibility. Flashing Morse 'W' (as per Condition 3.2.3.3 of the Wind Farm Marine Licence and at NLB request). Flash characteristic of all structures synchronised. Mounted on top of each nacelle (or highest fixed point). When visibility exceeds 5 kilometres, light intensity will be reduced to 10% (200 candela) of the minimum peak intensity. Operation automatic however manual override possible via Development Marine Co-ordination Centre. Compatible with NVIS. SAR Light: <ul style="list-style-type: none"> The 2,000 candela aviation warning light (where fitted to peripheral structures as noted above) will be adjustable in intensity to 200 candela where the SAR coordination authority and / or the SAR helicopter or aircraft request it. Compatible with NVIS.
Internal Structures A13, B07, B08, B11, B20, C07, C14, C18, C19, D05, D06, D13, D15, D22, E12, E16, E18, F05, F06, F08, F13, F17, G07, G10, G12, G14, G21, OSS-N, OSS-S	SAR Light: <ul style="list-style-type: none"> Red low intensity (200 candela). 360° visibility. Fixed illumination (no flash required). Mounted on top of each nacelle (or highest fixed point). During routine operations light switched off. Switched on at request of SAR coordination authority and / or the SAR helicopter or aircraft. Compatible with NVIS. Compliant with requirements of MGN 543 SAR Annex 5.

28. Additionally, all turbines and the OSPs will be lit with a low intensity green heli-hoist light capable of both steady and flashing illumination, and visible through 360°, fitted to the winching area platform of each structure. As set out in Appendix J of CAP 437, the heli-hoist light should be conspicuous at a range of at least 500m and detectable at a range of at least 700m in a meteorological visibility of 3km in daylight. The heli-hoist light will be visible from all angles of azimuth so as to be visible to the pilot during the approach to the wind turbine and throughout operations. It is noted that the lights will only be lit when heli-hoist operations are being undertaken.

29. Visibility meters will be fitted to four turbines around the periphery of the turbine array with aviation lighting to detect when visibility is greater than 5km, in which case the light intensity of the 2000cd lights will be automatically reduced from 100% to 10%. The location of the visibility meters was agreed with CAA (by email, received on the 02 December 2012). All peripheral turbines will display the 2000cd light when any visibility meter detects that visibility is less than 5km.
30. Aviation lighting will be controllable from the Marine Co-ordination Centre. All lights and turbines will be under the control of the Marine Co-ordination Centre so that they can be switched on / off via the central control system required during an emergency situation.

4.3.2 Blade Hover Reference Marking

31. The blade hover reference marking for the Project during the operational phase has been designed to be compliant with the relevant requirements set out in the following guidance:
 - MCA, MGN 543, OREIs - Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response Issue (MCA, 2016); and
 - MGN 543 SAR Annex 5: Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MCA, 2018).
32. Blade hover reference marks will be provided on the turbine blades to provide a SAR helicopter pilot with a reference mark when hovering over a turbine nacelle during a rescue. Three marks will be added, one each at the 10, 20 and 30 metre interval (measured from the hub) and placed on the trailing edge of the blades so that the marks lie upwards in view of the helicopter pilot when the blades are parked in the 'Y' position or offset 'Y' (i.e. one blade angled forward into the wind).
33. All hover reference marks will be painted in a contrasting red colour (RAL 3020) on both sides of the blades. The diameter of the marks (which will be dots / stripes) will be at least 600mm but can be larger depending on the overall size of the blade.
34. The blade tip will also be marked in red (RAL 3020). However, as the tip of the blade may contain lightning protection equipment, the red mark may be moved inwards (towards the nacelle) to avoid interaction with it. Details of the final blade design shall be notified to the MCA when finalised.
35. An example of the blade hover reference marks is illustrated in Figure 4-2.

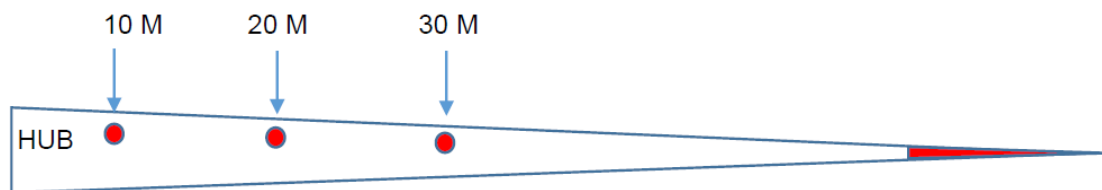


Figure 4-2: Example Blade Hover Reference Marks

4.3.3 Identification Marks

36. Individual identification (ID) numbers will be marked on the turbine nacelle roofs so that SAR helicopters and/or other low flying aircraft can locate and/or reference a particular turbine visually. The ID number system is shown in Figure 3-2.
37. ID numbers will be recognisable from an aircraft flying 500 feet (150 m) above the highest part of the fixed structure. The ID number will be as large as practicable but not less than 1.5 metres in height and of proportionate width.

4.3.4 Obstruction Marks

38. The obstruction marking for the Project during the operational phase has been designed to be compliant with the relevant requirements set out in the following guidance and policy documents:
- CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016).
 - CAA CAP 437 – Standards for offshore helicopter landing areas (CAA, 2018).
39. Winching areas / heli-decks will be marked as per the requirements of CAP 437.

4.4 Aviation Lighting – Emergency Reporting

40. The aviation lighting emergency reporting for the Project during all phases has been designed to be compliant with the relevant requirements set out in the following guidance and policy document:
- CAA Policy Statement April 2012 - Failure of Aviation Warning Lights on Offshore Wind Turbines (CAA, 2012a).
41. The Air Navigation Order states, “In the event of the failure of any light which is required to be displayed by night the person in charge of a wind turbine generator must repair or replace the light as soon as reasonably practicable.”
42. It is accepted in the case of offshore wind farms that there may be occasions when meteorological or sea conditions prohibit the safe transport of staff for repair tasks. Furthermore, there may be fault conditions which are wider ranging and would take longer to diagnose or repair. In such cases international standards and recommended practices require the issue of NOTAM.
43. The CAA’s Directorate of Airspace Policy considers the operator of an offshore wind farm as an appropriate person for the request of a NOTAM relating to the lighting of their wind farm. Should the anticipated outage be greater than 36 hours, NNGOWL shall request a NOTAM to be issued by informing the NOTAM section of the UK Aeronautical Information Service (UKAIS) as soon as possible. Contact is the CAA’s Airspace Utilisation Section (AROps@caa.co.uk / 0207 453 6599). The following information will be provided when requesting a NOTAM:
- Name of the wind farm (as already recorded in the Aeronautical Information Publication (AIP));
 - Identifiers of affected lights (as listed in the AIP) or region of wind farm if fault is extensive (e.g. north east quadrant / entire wind farm / 3 nautical miles (nm) centred on position X);
 - Expected date of reinstatement; and
 - Contact telephone number.
44. Upon completion of the remedial works, the UKAIS will be notified as soon as possible to enable a cancellation to be issued. The party that originally requested the NOTAM will then issue such notification so that a NOTAM cancellation notice can be issued. Such notification will include the name of the wind farm and the reference of the original NOTAM.
45. If an outage is expected to last longer than 14 days then the CAA will also be notified (at Windfarms@caa.co.uk) by NnGOWL directly to discuss any issues that may arise and longer term strategies.
46. In order to expedite the dissemination of information during active aviation operations NnGOWL may also establish a direct communication method with other operators in the area, for example Local Air Traffic Service Units, Local Airports, and Local Helicopter Operators (operations rooms). The information provided shall be the same as the information provided in the NOTAM and where possible include a NOTAM reference.

47. NnGOWL will have overall responsibility for requesting the issuing of NOTAMs and as such will undertake appropriate communications with the CAA and other operators.

5 Marine Navigation Lighting and Marking

5.1 Introduction

48. This section sets out the marine navigation lighting and marking arrangements for the Project, including lighting and marking technical specifications.
49. The marine navigation lighting and marking has been agreed with NLB and MCA and is compliant with the current standard requirements for offshore wind farm structures (as set out in Appendix A). The relevant guidance is set out in relation to each of the specific lighting and marking elements in the following sections.

5.2 Promulgation of Information

50. Details of the Project will be promulgated to relevant marine stakeholders in advance of, and during, construction, and also during the operational/maintenance phase where appropriate through the use of local Notice to Mariners (NtMs). Full details of promulgation of information (including that considered pertinent to lighting and marking, e.g., marking on Admiralty Charts) that will be undertaken by NnGOWL, including a full list of stakeholders to which information will be promulgated, are provided in the NSVMP.

5.3 Statutory Sanction

51. NnGOWL will submit an application for statutory sanction to the NLB prior to the implementation, alteration, or removal of any aid to navigation associated with the Project that is to be exhibited for at least six months. As per Section 5.6 NnGOWL will also report AtoN availability to the NLB via the Aid to Navigation availability reporting database (LATONS).

5.4 Marine Navigational Lighting and Marking – Construction

52. This section details temporary marine AtoN, including lighting and marking, during the construction phase of the Project.
53. The details have been agreed with NLB¹ in principle and follow the relevant requirements of:
- IALA Recommendations O-139 (The Marking of Man-Made Offshore Structures, Edition 2) (IALA, 2013)².
 - MCA, MGN 543, OREIs - Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response Issue (MCA, 2016).
 - MGN 543: SAR Annex 5. Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MCA, 2018).

5.4.1 Temporary Lighting of Structures

54. Following installation of a jacket substructure each transition piece will be fitted with a mounted FI Y 2.5s light (visible through 360°) with a 2 nautical mile 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.

¹ Meeting date 05 February 2019

² Based on consultation with the NLB no IPS lighting is being proposed for the Project.

5.4.2 Construction Buoyage

55. The wind farm site will be marked as a construction area during the construction phase. The proposed construction buoyage has been developed in consultation with NLB. The agreed construction buoyage is presented in Figure 5-1 and summarised in Table 5-1.

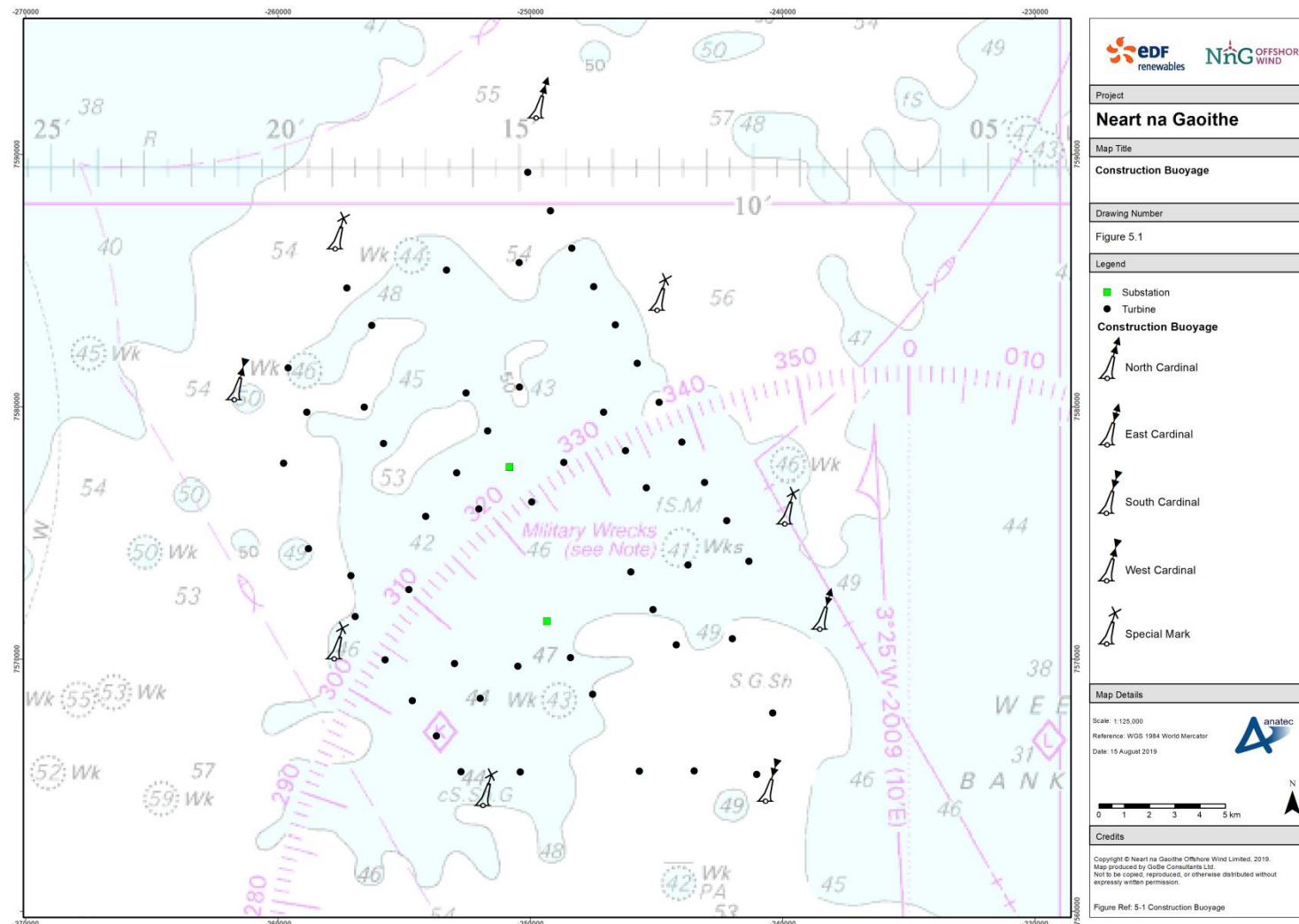


Figure 5-1: Construction Buoyage

Table 5-1: Construction Buoyage Positions

BUOY	LOCATION		SPECIFICATION
	LAT	LONG	
North Cardinal	56° 20' 25.48" N	002° 14' 36.99" W	Quick (Q) white light character
East Cardinal	56° 14' 19.75" N	002° 08' 33.47" W	Q (3) 10 s white light character
South Cardinal	56° 12' 17.62" N	002° 09' 45.63" W	Q (6) + Long (L) FL 15 s white light character
West Cardinal	56° 17' 03.43" N	002° 21' 05.03" W	Q (9) 15 s white light character
Special Mark	56° 18' 10.81" N	002° 12' 04.50" W	Fl Y 5s light character
Special Mark	56° 15' 38.58" N	002° 09' 19.76" W	Fl Y 5s light character
Special Mark	56° 12' 17.62" N	002° 15' 47.79" W	Fl Y 5s light character
Special Mark	56° 14' 02.31" N	002° 18' 58.41" W	Fl Y 5s light character
Special Mark	56° 18' 55.46" N	002° 18' 57.05" W	Fl Y 5s light character

56. All buoys (cardinal and special marks) employed throughout the construction phase shall be pillar shaped, have a focal plane of 3 – 5 m and a range of 5 nm. The buoys shall also meet the following IALA and NLB standards in terms of availability:
 - Cardinal marks: IALA Category 1 (99.8%); and
 - Special marks: IALA Category 2 (99.0%).
57. The availability of all AtoNs employed throughout the construction phase shall be calculated over a rolling three year period. This will be recorded using NLBs online AtoN reporting system.
58. The special mark buoys employed throughout the construction phase shall be marked with a yellow 'X' shaped topmark.
59. The four cardinal buoys will all transmit via AIS during the construction phase, noting that NnGOWL or an appointed contractor will procure the relevant AIS licences via applications to Ofcom.
60. All required construction phase buoyage will be established at least 4 weeks prior to the commencement of works and remain in place until the operational marking requirements have been inspected and passed by NLB.

5.4.3 Construction Vessels

61. All vessels associated with the construction of the Project will be marked and lit as per COLREGs 1972 and will comply with legislation appropriate for their class and area of operation as set out in the NSVMP.

5.5 Marine Navigation Lighting and Marking – Operation

62. This section details permanent marine AtoN, including lighting and marking, during the operational phase of the Project.

63. The details have been agreed with NLB³ in principle and follow the relevant requirements of:
- IALA Recommendations O-139 (The Marking of Man-Made Offshore Structures, Edition 2) (IALA, 2013)⁴.
 - MCA, MGN 543, OREIs - Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response Issue (MCA, 2016).
 - MGN 543: SAR Annex 5. Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MCA, 2018).

5.5.1 Marine Aids to Navigation

64. This section details the agreed marine AtoN which comprise the marine navigation lighting and marking during the operational phase of the Project.
65. The agreed marine navigation lighting and marking (which complies with IALA and NLB requirements) of the Project is presented in Figure 5-2 and summarised in Table 5-2.

³ Meeting Date 05 February 2019

⁴ It is noted that this document is understood to be currently being updated to state that IPS lighting is no longer necessary. Based on consultation with the NLB no IPS lighting is therefore being proposed for the Project.

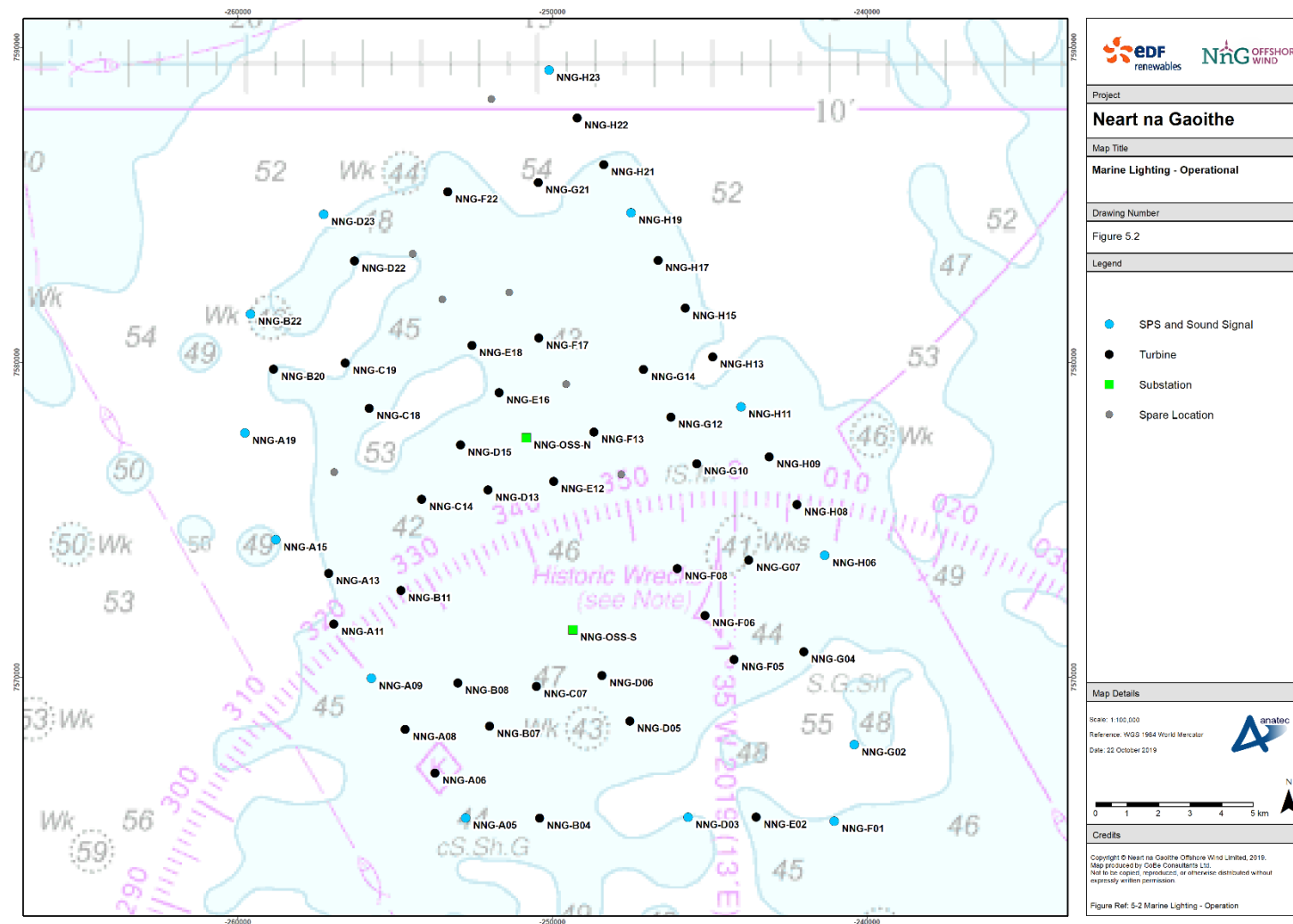


Figure 5-2: Marine Lighting – Operation

Table 5-2: Operational Lighting Summary (Marine)

STRUCTURE	SPECIFICATION
Significant Peripheral Structure (SPS) A05, A09, A15, A19, B22, D03, D23, F01, G02, H06, H11, H19, H23	<ul style="list-style-type: none"> Located on a corner or other significant point Flashing Yellow. 5 Seconds. (FL. Y. 5s) 5nm nominal range 360° visibility IALA Category 1 availability – 99.8% All SPS lights shall be synchronised Lights shall be located not less than 6m and not more than 30m above Highest Astronomical Tide (HAT)
Fog Signal Fitted to every SPS	<ul style="list-style-type: none"> Morse U in rhythmic blasts every 30s Minimum duration of each blast shall be 0.75s 2nm nominal range 360° audibility IALA Category 3 availability – 97.0% Remotely operated to turn on when visibility 2nm or less Fitted with a functionality test Mounted at least 6m above HAT and a maximum of 30m, and not higher than the lowest point of the arc of the blades. Each turbine fitted with a sound signal will also have a visibility meter.

66. All marine lights and sound signals will be remotely operable via the central control system.

5.5.2 Identification Marks

67. Each wind farm structure will display identification panels with black letters / numbers on a yellow background visible in all directions. The identification characters will be illuminated by a low-intensity light visible from a vessel thus enabling the structure to be detected at a suitable distance to avoid a collision with it. For offshore wind farms, the size of the identification characters in combination with the lighting will be such that, under normal conditions of visibility and all known tidal conditions, they are clearly readable by an observer stationed 3m above sea level, and at a distance of not less than 150m from the structure.

68. The ID number system is shown in Figure 3-2.

5.5.3 Turbine Paint

69. Turbines will be painted in line with IALA O-139 (IALA, 2013). Full details are provided in the DSLP.

5.5.4 Automatic Identification System (AIS)

70. During the operational phase, four of the SPS (A05, B22, F01, and H23) will transmit via AIS, as shown in Figure 5-3. The AIS transmitters will be required to have an availability of not less than 97.0% (IALA Category 3). NnGOWL or an appointed contractor will procure the relevant AIS licences via applications to Ofcom as required.

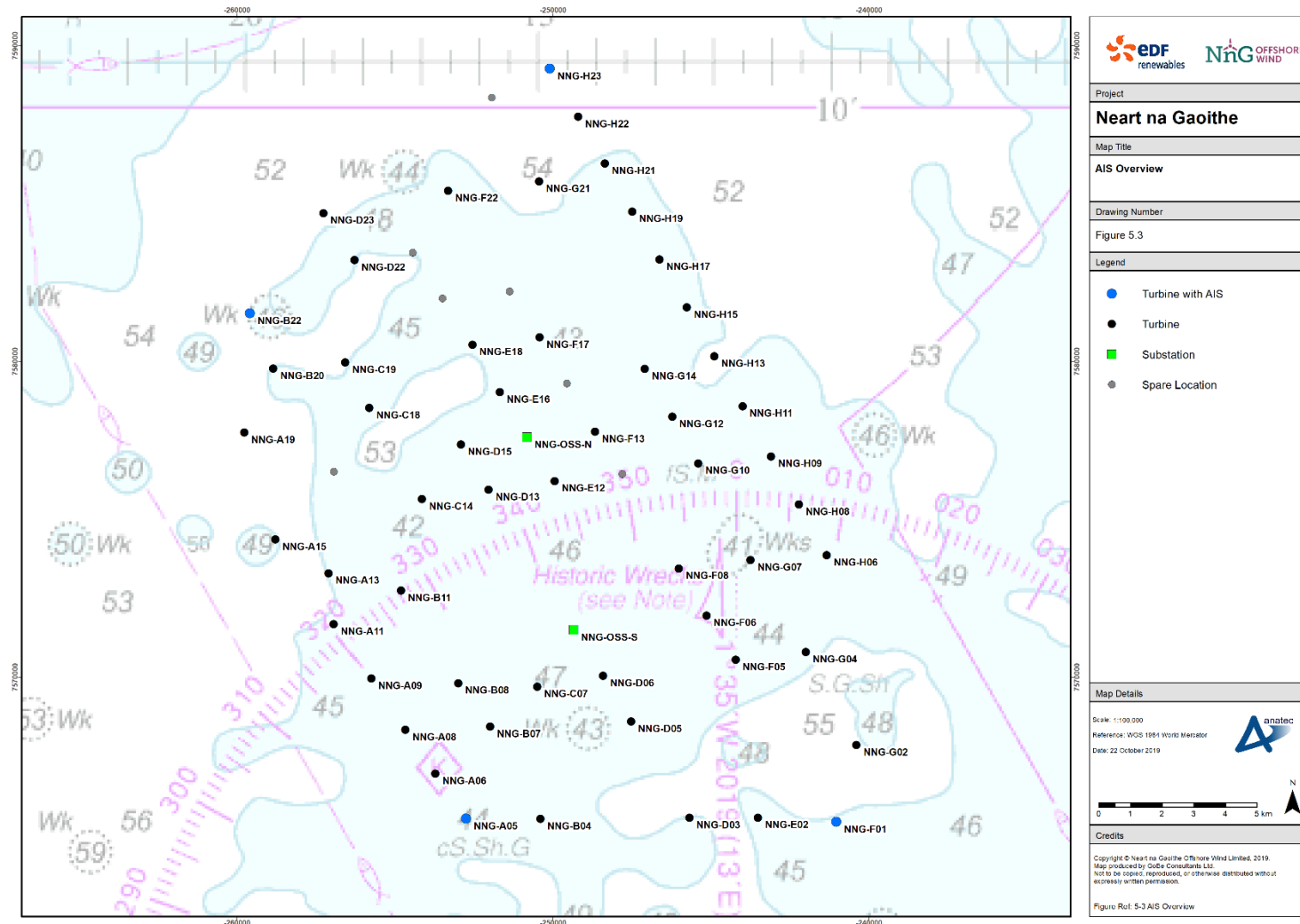


Figure 5-3: AIS Overview

5.5.5 Offshore Substation and Marking

71. The sides of the offshore substations will be marked with a clear and visible unique identification characters visible from marine vessels. The substations will each be assigned a unique reference to identify this asset as a substation (NNG-OSS-N and NNG-OSS-S as per Figure 3-2).
72. The structures will be coloured as follows:
 - Foundations will be painted yellow (RAL 1023 – Traffic Yellow) from HAT up to the interface point in line with IALA O-139 (IALA, 2013); and
 - Above this height, the topside structures will be painted grey (RAL 7035, Light Grey).

5.5.6 Export Cable Marker Boards

73. No marking of the export cable landfall is considered necessary based on consultation with the NLB and MCA.

5.6 Failure of Construction Buoyage or Operational Marine Navigation Lighting and Marking

74. A requirement of the management of marine AtoN within UK waters is to report failures to NLB. This is done through the NLB LATONS system. The system is administered by NLB in order to assist wind farm operators fulfil their responsibility to maintain records of AtoN availability and to provide summaries of these to NLB. This system should be used to report any failure or loss of availability of any AtoN.
75. NnGOWL will have overall responsibility to provide records of AtoNs and details of failure or losses to NLB. The NSP and VMP provide specific details on other reporting requirements and notifications to local mariners.
76. It is noted that in the rare event of a significant loss of an AtoN such that a significant risk to navigation is considered likely to occur, a guard vessel may be required to maintain navigational safety until such time as the AtoN is repaired or replaced.

5.7 Additional Lighting not required by the Conditions

77. Working lights, such as down lighting on ladders and access platforms, when in use will not compromise the conspicuousness of navigational marking lights. Low level lighting will be used on the boat landing and will be fitted so as not to impact on navigational lights. The boat landing lighting will be such that during a transfer the boat landing will be visible in all directions during periods of poor visibility or hours of darkness.

6 Compliance with the Application

78. In addition to the conditions presented in Table 1-1, Condition 7 of the S36 Consent states that:

“Except as otherwise required by the terms of this consent, the Development must be constructed and operated in accordance with the Application (as supplemented by the additional environmental information (EIA Addendum), submitted by the Company on 26 July 2018) and any other documentation lodged in support of the Application.”

79. Condition 3.1.1. of the Wind Farm Marine Licence states that:

“The Licensee must at all times construct, operate and maintain the Works in accordance with this licence, the Application, the section 36 consent and the plans and programmes approved by the Licensing Authority.”

80. And conditions 3.1.1 of the OfTW Marine Licence states that:

“The Licensee must at all times construct, operate and maintain the Works in accordance with this licence, the Application and the plans and programmes approved by the Licensing Authority.”

81. Sections 6.1 and 6.2 set out information from the documentation submitted as part of the Application with regard to:

- Compliance with the lighting and marking scheme assessed; and
- Delivery of the stated lighting and marking-related mitigation.

6.1 Compliance with the Application and supporting information

82. The Application described a range of specification and layout options that could be applied during the construction of the Project. This took the form of a broad ‘Design Envelope’ incorporating a variety of options. The Application defined likely lighting and marking requirements for the Project, based upon these broad options and which adhered to marine navigation and aviation standard guidance.

83. Since the Offshore Consents were awarded, the design of the Project has been refined. In order to demonstrate continued compliance of this refined design, Appendix B provides a tabulated comparison of lighting and marking specifications as presented in the Application and this LMP.

6.2 Delivery of Mitigation proposed in the Application and supporting information

84. The Application detailed a number of mitigation commitments specific to the design of the Project. Measures relevant to lighting and marking are presented in full in Appendix C, which also identifies where each commitment has been addressed within this LMP (or within other relevant NnGOWL Consent Plans).

7 References

CAA (2012a). Policy Statement April 2012 - Failure of Aviation Warning Lights on Offshore Wind Turbines. London: CAA.

CAA (2012b) Policy Statement November 2012 - The lighting and marking of wind turbine generators and meteorological masts in United Kingdom territorial waters. London: CAA.

CAA (2016) CAP 764 – CAA Policy and Guidelines on Wind Turbines. February 2016. London: CAA.

CAA (2018) CAP 437 – Standards for Offshore Helicopter Landing Areas. September 2018. London: CAA.

CAA (2016) CAP 393 – Air Navigation: The Order and the Regulations. March 2019. London: CAA.

IALA (3013). Recommendations O-139 on the Marking of Man-Made Structures. Edition 2. December 2013. Saint Germain en Laye, France: IALA.

IMO (1972). COLREGS. London: IMO.

MCA (2016). MGN 543. Offshore Renewable Energy Installations - Guidance on UK Navigational Practice, Safety and Emergency Response. Southampton: MCA.

MCA (2018) Annex 5 to MGN 543. Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response. Southampton: MCA.

MOD (2014) MOD Obstruction Lighting Guidance. November 2014.

Appendix A Legislation, Guidance, and Policy

86. This Appendix details the relevant legislation, policy and guidance that are in place at the time of authorship of this LMP, and have thus informed its preparation.

A.1 Marine Navigation

- IALA Recommendations O-139 (The Marking of Man-Made Offshore Structures, Edition 2) (IALA, 2013).
- Department For Environment and Climate Change (DECC) Standard Marking Schedule for Offshore Installations (DECC, 2011).
- MCA, MGN 543, OREIs - Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response Issue (MCA, 2016).

87. It should be noted that IALA O-139 is currently being updated. Based on consultation with the NLB, one key change within the guidance will be the removal of the requirement to mark selected Intermediate Periphery Structure (IPS), with SPS becoming the only form of marine lighting. In line with this, and in agreement with the NLB, this LMP has been drafted so as to only propose the use of SPS.

A.2 Aviation & DIO

- The Air Navigation Order 2016. Statutory Instrument No. 3015. With deviation to Article 223 at NLBs request.
- CAA Policy Statement April 2012 - Failure of Aviation Warning Lights on Offshore Wind Turbines (CAA, 2012a).
- CAA Policy Statement November 2012 - The lighting and marking of wind turbine generators and meteorological masts in United Kingdom territorial waters (CAA, 2012b).
- CAA Civil Aviation Publication (CAP) 437 – Standards for offshore helicopter landing areas (CAA, 2018).
- CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2016).
- MOD Obstruction Lighting Guidance, November 2014 (MOD, 2014).

A.3 Emergency Response

- MCA, Offshore Renewable Energy Installations, ERCoP for Construction and Operation Phase, and Requirements for Emergency Response and Search and Rescue (SAR) Helicopter Operations (MCA, 2019).

Appendix B Compliance with Lighting and Marking assessed in the Application

88. This Appendix sets out elements pertinent to lighting and marking that were assumed within the EIA Report and Addendum, with a reference for each to the section within this LMP that demonstrates compliance with the relevant assumption. This process is summarised in Table B.1.

Table B.1: Comparison of EIA Report and Addendum Design Envelope and LMP lighting and marking specifications

LIGHTING AND MARKING ELEMENT	EIA REPORT AND ADDENDUM		LMP
	REFERENCE	PARAMETER	
Number of Turbines	EIA Report, 4.4.2	Up to 54	54
Number of Substations	EIA Report, 4.4.2.1	2	2
Stakeholder Requirements on Lighting and Marking	EIA Report, 4.4.5.4	The turbines and associated support structures will be marked according to the requirements of the NLB.	See Appendix A.
Paint Colours	EIA Report, 4.4.5.4	Consultation is ongoing but the colour of the turbine tower, nacelle and blades is likely to be light grey RAL 7035. The transition piece and tower will be yellow above LAT to an agreed height above HAT.	See Section 5.5.3.
Marking of Substations	EIA Report, 4.4.5.4	As for the turbines, the OSP(s) will be marked according to the requirements of the NLB. Navigation markings may be allocated solely to a number of wind turbines in the field.	See Section 5.5.5 for OSP marking. Navigation marking of turbines is detailed in Sections 4 and 5.
Aviation Marking Requirements	EIA Report, 4.4.5.5	The legal requirement for offshore wind turbine aviation lighting is stipulated in Article 223 of the Air Navigation Order 2016 (reproduced in CAP393 Air Navigation: The Order and the Regulations), with other documents providing further policy information and guidance.	See Appendix A.
Periphery Aviation Lighting	EIA Report, 4.4.5.5	It is noted that the Air Navigation Order only requires medium intensity red lighting to be fitted to turbines on the periphery of a group of turbines subject to approval by the CAA.	The proposed aviation lighting scheme is given in Section 4.3.1

LIGHTING AND MARKING ELEMENT	EIA REPORT AND ADDENDUM		LMP
	REFERENCE	PARAMETER	
SAR Helicopter Lighting and Marking	EIA Report, 4.4.5.5	Additional requirements relate to the requirement for lighting and marking relating to the use of helicopter landing facilities on turbines and also for the purposes of assisting SAR operations	See Section 4.3.
Stakeholder Requirements on Aviation Lighting and Marking	EIA Report, 4.4.5.5	Aviation lighting for the final layout design will be agreed with the CAA (and in relation to SAR operations with the MCA).	The proposed aviation lighting scheme is given in Section 4.3.1
Aviation Lighting Requirements	EIA Report, 4.4.5.5	Three types of lighting are mandatory on wind turbines: medium intensity red lights, low intensity green lights, and low intensity red lights. In addition, low intensity infrared (i.e. invisible to the eye) lighting may be requested.	See Section 4.3.1. It is noted that the MCA now require SAR lights to be infrared compatible.

Appendix C Application Commitments

89. Table C1 presents the commitments made by NnGOWL in the EIA Report and the Addendum to mitigation measures relevant to this LMP. The table provides details of the commitments and a cross-reference to where each commitment is implemented.
90. A complete register of the mitigation, management and monitoring commitments made in the EIA Report and the Addendum and required by consent conditions is set out in the commitments registers included as part of the Environmental Management Plan (EMP).

Table C1 EIA Report and the Addendum mitigation relevant to the LMP

SOURCE	REFERENCE	DETAILS OF COMMITMENT	IMPLEMENTATION
EIA Report	Project Description	The legal requirement for offshore wind turbine lighting is stipulated in Article 223 of the Air Navigation Order 2016 (reproduced in CAP393 Air Navigation: The Order and the Regulations), with other documents providing further policy information and guidance.	All relevant guidance has been considered as per Appendix A.
EIA Report	Project Description	The turbines and associated support structures will be marked according to the requirements of the NLB and CAA. Consultation is ongoing but the colour of the turbine tower, nacelle and blades is likely to be light grey RAL 7035. The transition piece and tower will be yellow above LAT to an agreed height above highest astronomical tide (HAT). As with the turbines the offshore collector substations will be marked according to the requirements of the NLB and CAA. Navigation markings may be allocated solely to a number of wind turbines in the field.	See Section 5.5.5 for OSP marking. Navigation marking of turbines is detailed in Sections 4 and 5. This LMP will be agreed with the NLB, MCA, and CAA prior to finalisation.
EIA Report	Shipping and Navigation	Neart na Gaoithe will be charted by the UKHO using the magenta turbine tower chart symbol found in publication 'NP 5011 - Symbols and Abbreviations used in Admiralty Charts'. Submarine cables associated with Neart na Gaoithe will also be charted on the appropriate scale charts. Export cables will be charted by the UKHO on the appropriate scale charts and potential to note no anchorage areas over charted cables.	See Section 5.2.
EIA Report	Shipping and Navigation	Neart na Gaoithe structures to be marked and lit in line with NLB and IALA (O 139) guidance. As per IALA, any	All relevant guidance has been considered as per Appendix A.

SOURCE	REFERENCE	DETAILS OF COMMITMENT	IMPLEMENTATION
		lighting required for aeronautical purposes is to be shielded / arranged such that it is not visible to shipping.	
EIA Report	Shipping and Navigation	Compliance with MGN543: SAR Annex 5.	All relevant guidance has been considered as per Appendix A.
EIA Report	Civil and Military Aviation	<p>Information Circulation: Appropriate liaison to ensure information on the construction of the wind farm is circulated in NOTAM and other appropriate media.</p> <p>Hydrographic Office (UKHO) will be provided with the positions and maximum heights of the wind turbines and construction equipment above 150 m LAT. Coordinates and maximum heights of the wind turbines will be provided to the UKHO for aviation charting purposes within one month of the final commissioning of the Project. The UK IAIP is updated on a monthly basis under the Aeronautical Information Regulation and Control (AIRAC) system. Information provided under the AIRAC system shall be distributed by AIS at least 42 days in advance of the effective date with the objective of reaching recipients at least 28 days in advance of the effective date.</p> <p>Aviation Chart Marking: Prior to operation, information in line with that previously provided to the UKHO will be promulgated to NATS AIS for inclusion in the UK IAIP (NATS, 2017) and to the DGC for marking on related aeronautical charts and documentation.</p>	See Section 4.2.
EIA Report	Civil and Military Aviation	<p>Lighting and Marking Plan: The Project construction works will be marked in line with CAP 393 (CAA, 2017) and CAP 437 (CAA, 2016a) and as agreed with the CAA. A Lighting and Marking Plan will be submitted for approval, to MS-LOT outlining the Projects lighting and marking strategy to mitigate the risk to aviation safety during construction of the Project.</p> <p>The Project will be designed as per MGN 543, including Annex 5 which details 'Standards and procedures for generator</p>	All relevant guidance has been considered as per Appendix A. This LMP will be agreed with the NLB, MCA, CAA and MOD prior to finalisation.

SOURCE	REFERENCE	DETAILS OF COMMITMENT	IMPLEMENTATION
		shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an OREI.	