Morven South Offshore Wind Array Project

Environmental Impact Assessment Report

Volume 4, Annex 4: Lighting and Marking Plan (LMP) (Version 1)

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Document status

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Glossary

Term	Meaning
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed, and current status, (e.g. under power). Most commercial vessels and United Kingdom (UK)/European Union (EU) fishing vessels over 15 metre (m) length are required to carry AIS.
The Applicant	Morven Offshore Wind Limited (MvOWL).
Designed-in measures	Either primary or tertiary mitigation measures, which are considered inherent to the project's design. Includes: • Measures included as part of the project design; • Industry standard measures committed to by the Applicant (including post-consent management plans); • Measures required to meet legislative requirements.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provides significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Morven Option Lease Agreement Site (hereafter "Morven Site")	The 859km^2 area awarded to bp and EnBW's 'Morven' project, identified as a result of the ScotWind leasing round and located in Plan Option (PO) area E1. Morven North and Morven South are two distinct projects, located with the Morven Option Lease Agreement Site.
Morven North Offshore Wind Array Project (hereafter "Morven North")	The Morven North Offshore Wind Array Project, which includes the wind turbines and foundations, Offshore Substation Platforms (OSP) and foundations, inter-array and interconnector cables and associated infrastructure located within the Morven North Boundary. Consent for the export cables for Morven North will be sought separately.
Morven South Offshore Wind Array Project (hereafter "Morven South")	The Morven South Offshore Wind Array Project, which includes the wind turbines and foundations, OSPs and foundations, inter-array and interconnector cables and associated infrastructure located within the Morven South Boundary. Consent for the export cables for Morven South will be sought separately.
OSPs	OSPs comprise the support structure, topside and electrical components used for collecting the electricity generated by the wind turbine generators for the passage or transmission to landfall. These OSPs can be divided into two types: • HVAC (High Voltage Alternating Current) collector substations; • HVDC (High Voltage Direct Current) converter substations.
Wind turbine	A machine that converts kinetic energy from the wind into electricity comprising the following main parts: nacelle, hub, blades, tower and drivetrain.

Acronyms

Unit	Meaning
ACOMS	Airspace Co-ordination Obstacle Management Service
AIS	Automatic Identification System
ANO	Air Navigation Order
AtoN	Aid to Navigation
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
DECC	Department of Energy and Climate Change
HAT	Highest Astronomical Tide
IALA	International Organization of Marine Aids to Navigation
ID	Identification
IPS	Intermediate Peripheral Structure
IR	Infrared
LMP	Lighting and Marking Plan
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate Licensing Operations Team
MGN	Marine Guidance Note
MOD	Ministry of Defence
NLB	Northern Lighthouse Board
NOTAM	Notice to Airmen
NSPVMP	Navigational Safety Plan and Vessel Management Plan
NVIS	Night Vision Imaging System
O&M	Operation and Maintenance
OSP	Offshore Substation Platform
SAR	Search and Rescue
SCADA	Supervisory Control and Data Acquisition
SPS	Significant Peripheral Structure
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office

Units

Unit	Meaning
°	Degrees (angle)
%	Percentage
cd	Candela (luminous intensity)
K	Kelvin
km	Kilometre
m	Metre
mm	Millimetre
nm	Nautical Mile

1 Introduction

1.1 Background

1.1.1.1 The Morven North Offshore Wind Array Project (hereafter, 'Morven North') and the Morven South Offshore Wind Array Project (hereafter, 'Morven South') are both located within the Morven Option Lease Agreement Site (hereafter, 'Morven Site') in Scottish offshore waters. Morven North is located approximately 61kilometres (km) from the Aberdeenshire coast (at its closest point) and Morven South is located approximately 86km from the Aberdeenshire coast (at its closest point). Each project will comprise wind turbines, Offshore Substation Platforms (OSP), associated foundations, inter-array and interconnector cables and cable protection. Consent for the offshore export cables of Morven North and Morven South will be sought separately. This Lighting and Marking Plan (LMP) will be agreed in consultation with key stakeholders including, the Northern Lighthouse Board (NLB), Maritime and Coastguard Agency (MCA), Civil Aviation Authority (CAA) and the Ministry of Defence (MOD).

1.1.1.2 This combined LMP (Version 1) has been developed for Morven North and Morven South to support the consent Applications for each project, however, pre-construction, an LMP will be developed for each project separately. This LMP (Version 1) will form the basis of each project's final LMP.

1.1.1.3 It is considered likely that an LMP will be a consent requirement of both the Section 36 Consents and Marine Licences for Morven North and Morven South. The finalised LMPs will therefore seek to discharge the consent conditions relating to lighting and marking, once known, as set out in Table 1.1. Table 1.1 will include reference to how and where the condition clauses have been addressed within the finalised LMPs.

Table 1.1: Consent conditions to be discharged by Lighting and Marking Plan

Condition reference	Condition text	Where addressed in LMP
[Consent condition details to be added post-consent award]		

1.2 Linkages with other plans

1.2.1.1 This LMP (Version 1) forms one of a number of plans for which the approval of the Marine Directorate -Licensing Operations Team (MD-LOT) will be sought, as required, and in compliance with, relevant consent conditions.

1.2.1.2 Table 1.2 provides an overview of other management plans relevant to this LMP (Version 1), and where these are referenced within this document.

Table 1.2: Linkages with other plans

Plan	Details contained in plan	Reference
Navigational Safety Plan and Vessel Management Plan (NSPVMP)	Details vessel management and navigational safety during the construction and operation and maintenance (O&M) phases of Morven North and Morven South, in order to mitigate the impact of project vessels	A NSPVMP is provided in Volume 4, Annex 5: Navigation Safety Plan and Vessel Management Plan (NSPVMP) (Version 1).

Plan	Details contained in plan	Reference
	and the navigational risk to other legitimate users of the sea.	
Emergency Response Cooperation Plan	Details relevant information relating to Morven North and Morven South appropriate actions in the event of an emergency situation.	An outline plan is not provided as part of Application as this document will be provided in full post-consent.

1.3 Project Background

1.3.1.1 The final layouts for each of Morven North and Morven South will be presented in Figure 1.1, and will include the proposed Identification (ID) marking that will be implemented (adhering to relevant MCA guidance, including a clear site identifier followed by sequential lettering and numbering based on row and position in line with Search and Rescue (SAR) requirements). A summary of relevant project design parameters is provided in Table 1.3.

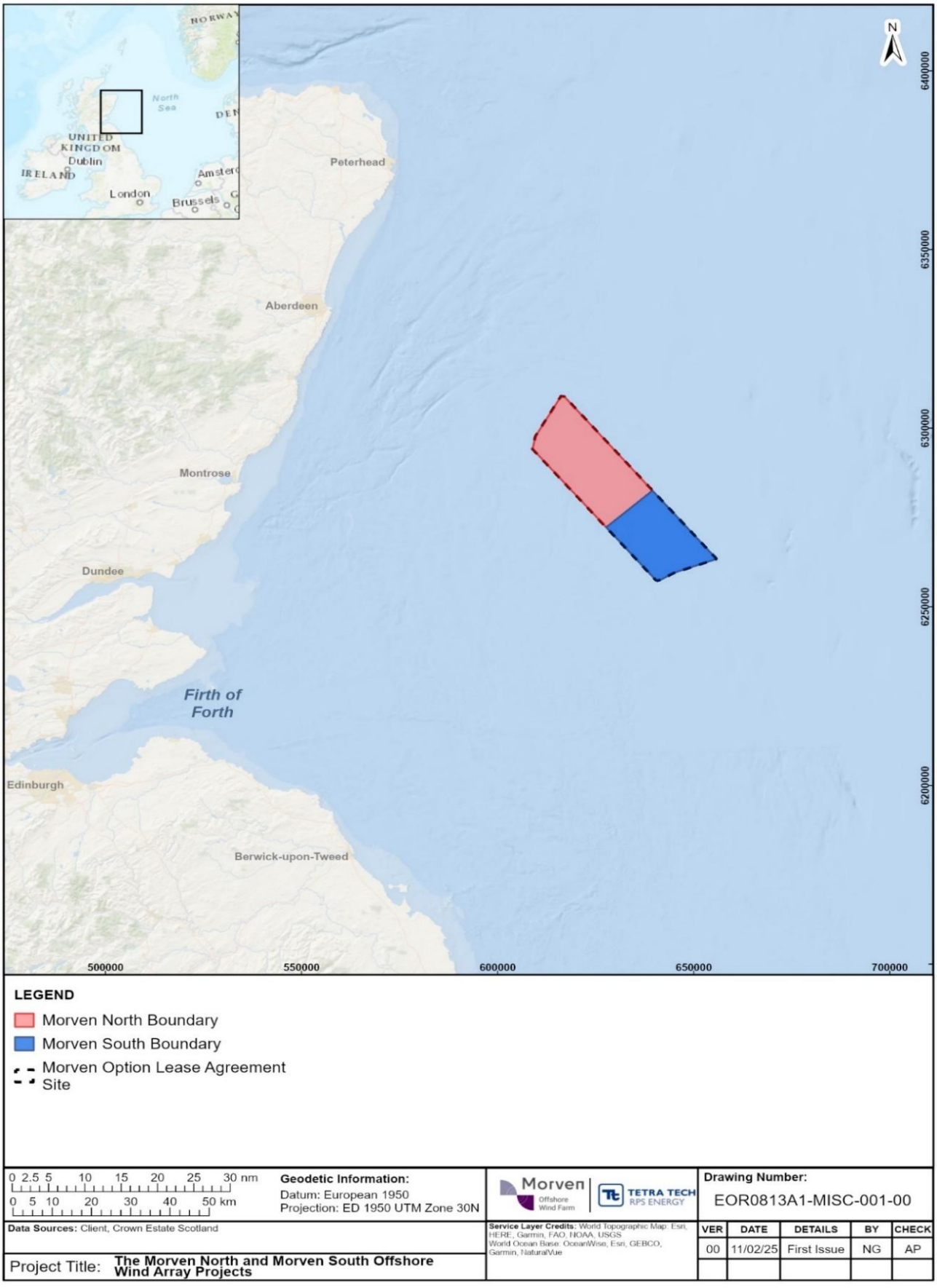

Figure 1.1: The boundaries of Morven North and Morven South within the Morven Option Lease Agreement Site

Table 1.3: Design parameters

Project component	Specification (Morven North)	Specification (Morven South)
No. of wind turbines	Up to 96	Up to 95
Wind turbine foundations	Monopile, four-legged jacket or three-legged jacket with pin piles and four-legged or three-legged jacket with suction buckets.	Monopile, four-legged jacket or three-legged jacket with pin piles and four-legged or three-legged jacket with suction buckets.
No. of OSPs	Up to five	Up to five
OSP foundations	Monopile, gravity-based structure, six-legged, four-legged or three-legged jacket with suction buckets and six-legged, four-legged, or three-legged jacket with pin piles.	Monopile, gravity-based structure, six-legged, four-legged or three-legged jacket with suction buckets and six-legged, four-legged, or three-legged jacket with pin piles.

1.3.1.2 In addition, Volume 3, Annex 13.1: Shipping and Navigation Shared Navigational Risk Assessment has identified designed-in measures relevant to lighting and marking, which have been described in Table 1.4.

Table 1.4: Designed-in measures relevant to Shipping and Navigation

Embedded Mitigation Measure	Description
Buoyed construction/ decommissioning area.	The array construction/decommissioning area will be marked by buoyage as required by NLB.
Compliance with Marine Guidance Note (MGN) 654 and its annexes.	The Project will be compliant with MGN 654 and its annexes (MCA, 2021). Includes MGN 654 SAR Annex 5 (MCA, 2024)
Guard vessels as required under risk assessment.	A guard vessel(s) will be deployed where deemed appropriate by risk assessment.
Appropriate lighting and marking.	Marking and lighting of the site in agreement with NLB and in line with International Organization of Marine Aids to Navigation (IALA) O139 (IALA, 2021 (a)) and G1162 (IALA, 2021 (b)). As per standard NLB requirements Statutory Sanctions will be sought prior to the establishment, alteration or removal of any aid to navigation (AtoN).

Embedded Mitigation Measure	Description
Appropriate promulgation of information.	Local Notifications to Mariners and Kingfisher Bulletins will be updated and reissued at weekly intervals during construction and at least five days prior to planned maintenance works.

2 Guidance and consultation

2.1 Marine

2.1.1.1 The marine navigation lighting and marking detailed in Section 3 and Section 4.1 abides by the requirements in the following guidance documents:

- IALA O-139 Recommendations on the Marking of Man-made Offshore Structures (IALA, 2021 (a)) and G1162 Guidance on the Marking of Man-made Offshore Structures (IALA, 2021 (b));
- IALA R1001 – The IALA Maritime Buoyage System (IALA, 2023);
- MGN 654 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA, 2021).

2.1.1.2 Consideration has also been given to:

- Standard Marking Schedule for Offshore Installations (Department of Energy and Climate Change (DECC), 2011).

2.2 Aviation

2.2.1.1 The aviation lighting and marking detailed in Section 4.2 abides by the requirements set out in the following guidance documents:

- CAA – The Air Navigation Order (ANO) (CAA, 2016) and Civil Aviation Publication (CAP) 393 (CAA, 2021 (b));
- CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2025);
- CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2021 (a));
- MGN 654 and Annexes – Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021);
- MOD Obstruction Lighting Guidance (MOD, 2020).

2.3 Consultation

2.3.1.1 In addition to consideration of relevant guidance, the Applicant will consult with relevant stakeholders on the contents of the finalised LMPs post-consent, including the MCA, NLB, CAA, and MOD.

3 Construction phase lighting and marking measures

3.1 Marine measures

3.1.1.1 The marine lighting and marking to be implemented during the construction phase of Morven North and Morven South will be summarised in Table 3.1. Table 3.1 also lists the relevant guidance/stakeholder for each aspect of lighting and marking where appropriate, noting that the guidance provides the full technical specifications required by the relevant stakeholders.

3.1.1.2 Figure 3.1 will set out the positions of the construction buoyage, with the associated coordinates and specifications to be provided in Table 3.2. For clarity, an ID will be provided for each of the buoys presented in Figure 3.1 and Table 3.2.

3.1.1.3 All buoyage for the construction phase will meet the following IALA specifications:

- radar reflectors;
- focal plane 3 metres (m) to 5m above the waterline;
- range five nautical miles (nm);
- minimum 3m diameter at the waterline.

3.1.1.4 As required, the Applicant will seek statutory sanction from NLB prior to deployment of any AtoN. The construction buoyage will be deployed at least four weeks prior to the commencement of construction. See Section 7.2 for procedures in cases of AtoN failure.

3.1.1.5 Should Morven North and Morven South be developed sequentially, there may be a need for multiple construction buoyage schemes with these implemented at different stages of the construction phase depending upon the build-out programme for Morven North and Morven South. This will be discussed with NLB as required during post-consent consultation.

3.1.1.6 All construction marine lighting on structures will be controllable remotely via the Supervisory Control and Data Acquisition (SCADA) system and with respect to any working lights (such as down lighting and access platforms). Consideration will be given to these being extinguished when not in use.

Table 3.1: Construction phase lighting and marking summary

Lighting and marking aspect	Relevant structures	Specifications	Figure illustration	Relevant guidance or stakeholder requirement
Temporary construction lighting (wind turbines and OSPs)	All structures	• Flashing (Fl) Yellow (Y) 2.5 seconds (s). • 360° visibility (multiple lights may be required). • At least 2nm range.	N/A	Industry standard
Construction buoyage	N/A	[Further specifications to be added post-consent (e.g., number/type of buoyage)] • Construction buoyage may need to be relocated, in consultation with NLB, when vessel types are confirmed. • Each buoy will be clearly identifiable via a physical name marking on the buoy that will include a clear reference to Morven North and Morven South. Any buoys transmitting via Automatic Identification System (AIS) will also include these names in the transmission.	Figure 3.1	Standard NLB requirement
Construction buoyage removal	N/A	Construction buoyage removed once NLB have provided written approval of	N/A	IALA R1001

Lighting and marking aspect	Relevant structures	Specifications	Figure illustration	Relevant guidance or stakeholder requirement
		the operational lighting and marking on the structures.		

[Figure showing construction buoyage relative to Morven North and Morven South to be added post-consent]

Figure 3.1: Construction buoyage

Table 3.2: Construction buoyage details

Buoy	ID	Latitude	Longitude	Light and topmark specification
[Buoy details to be added post-consent]				

3.2 Aviation measures

3.2.1.1 There will be no specific requirement for aviation lighting and marking to be implemented during the construction of the surface-piercing infrastructure; however, the transition to operational lighting and marking (Section 4.2) will be discussed with CAA post-consent and may involve the implementation of said lighting and marking scheme for some surface-piercing infrastructure during the construction phase.

3.2.1.2 Relevant information relating to Morven North and Morven South will be promulgated to aviation stakeholders as required under the relevant CAA guidance (see Section 2.2) prior to and during the construction phases of Morven North and Morven South. This approach to aviation measures during the construction phase will be agreed with CAA and MOD post-consent (and provided in the finalised LMPs).

4 Operation and maintenance phase lighting and marking measures

4.1 Marine measures

4.1.1.1 The marine lighting and marking to be implemented during the O&M phase will be detailed in Table 4.1 (wind turbines) and Table 4.2 (OSPs). These include a guidance column, which lists the guidance relevant to each lighting and marking aspect where appropriate (see also Section 2.1).

4.1.1.2 The overarching marine lighting and marking scheme will then be presented in Figure 4.1 relative to the approved layout.

4.1.1.3 As required, the Applicant will seek statutory sanction from NLB prior to deployment of any AtoNs. All O&M marine lighting will be controllable remotely via the SCADA system and with respect to any working lights (such as down lighting and access platforms). Consideration will be given to these being extinguished when not in use.

4.1.1.4 The process for the transition between construction phase and O&M phase marine lighting and marking measures will be agreed with NLB post-consent (and provided in the finalised LMPs).

Table 4.1: Operational wind turbine marine lighting and marking summary

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
Significant Peripheral Structure (SPS) lighting – where SPSs are those on the corners of the array and elsewhere on the periphery as decided by NLB.	Selected periphery structures: [Structures to be added once final layout agreed]	• Marine light marking selected periphery wind turbines as required under IALA. • Yellow 5 second flash (FL. Y. 5s). • At least 5nm range. • 360° visibility (multiple lights per structure may be required to achieve this). • All SPS should be synchronised. • Located not less than 6m above Highest Astronomical Tide (HAT) and below the arc of the rotor blades. • At least IALA category 1 (> 99.8% availability). • Uninterruptible Power Supply (UPS) of a minimum of 96 hours.	Figure 4.1	IALA O-139/G1162 and standard requirement
Intermediate Peripheral Structure (IPS) lighting – where IPSs are selected others on the periphery as decided by NLB.	Selected periphery structures: [Structures to be added once final layout agreed]	• Structures on the periphery of the layout other than SPS which require additional lighting. • Flashing yellow lights distinctly different from the SPS (typically	Figure 4.1	IALA O-139/G1162 and standard requirement

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		Yellow 2.5 second flash (Fl.Y.2.5s)). • At least a 2nm range. • 360° visibility (multiple lights per structure may be required to achieve this). • All IPS should be synchronised. • Located not less than 6m above HAT and below the arc of the rotor blades. • IALA Category 2 (>99.0% availability). • UPS of a minimum of 96 hours.		
Sound signals	Selected periphery structures: [Structures to be added once final layout agreed]	• Foghorns must face outward into open sea and overall sound signal coverage must be unimpeded by structures. • IALA Category 3 (at least 97.0% availability) over a rolling three-year period. • Each wind turbine fitted with a sound signal will also have a visibility meter. Sound signals will turn on	Figure 4.1	IALA O-139/G1162 and standard requirement

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		when visibility is detected to be less than 2nm. • Remote testing required.		
Visibility meters	Selected periphery structures: [Structures to be added once final layout agreed]	• Change in visibility will trigger all fog signals across the entire array. • Signal to activate when visibility is less than 2nm. • Visibility meters should be installed as per manufacturers requirements.	Figure 4.1	IALA O-139/G1162 and standard requirement
AIS	Selected periphery structures: [Structures to be added once final layout agreed]	• Availability of not less than 97.0% (IALA Category 3). • Office of Communications (OFCOM) Licence is required for the AIS transmission.	Figure 4.1	IALA O-139/G1162 and standard requirement
ID marker boards	All wind turbines	• IDs shown on all structures must be lit via low-level baffled (5 to 10 candela (cd)/m^2) lighting. • Uniformity factor better than 1:4. • Colour temperature should be between	N/A	MGN 654

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		2500 Kelvin (K) and 3500K. • 360° visibility (multiple boards will be needed to achieve this). • A font which has good readability should be used for ID characters. • Black characters on yellow background. • IDs must be readable by an observer stationed 3m above sea level at a distance of 150m.		
Wind turbine paint	All wind turbines	• Traffic yellow (RAL 1023) from HAT up to between 18m and 24m above HAT). • Light grey (RAL 7035) upwards of between 18m and 24m above HAT.	N/A	IALA O-139/G1162 and standard requirement

Table 4.2: Operational offshore substation platforms marine lighting and marking summary

Lighting and marking aspect	Indicative specifications	Relevant guidance or stakeholder requirement
ID marker boards	• IDs shown on all structures must be lit via low-level baffled (5 to 10 candela (cd)/m^2) lighting. • Uniformity factor better than 1:4. • Colour temperature should be between 2500K and 3500K. • 360° visibility (multiple boards will be needed to achieve this). • A font which has good readability should be used for ID characters. • Black characters on yellow background. • IDs must be readable by an observer stationed 3m above sea level at a distance of 150m.	MGN 654
OSP paint	• Traffic yellow (RAL 1023) from HAT to between 15m and 20m above HAT. • Topside Light Grey (RAL 7035) or other non-reflective grey materials. Excluding topside structures such as work cabins, cranes, ladders, and other working areas.	IALA O-139/G1162 and standard requirement

[Figure showing operational marine lighting and marking scheme for Morven North and Morven South to be added post-consent]

Figure 4.1: Marine operational lighting and marking

4.2 Aviation measures

4.2.1 Lighting and marking

4.2.1.1 Aviation lighting and marking to be implemented during the O&M phase will be summarised in Table 4.3 for the wind turbines and Table 4.4 for the OSPs. These include a guidance column, which lists the guidance relevant to each aviation lighting and marking aspect where appropriate (guidance is also detailed in Section 2.2).

4.2.1.2 The overarching aviation lighting and marking scheme will then be presented in Figure 4.2.

4.2.1.3 The process for the transition between construction phase and O&M phase aviation lighting and marking measures will be agreed with CAA and MOD post-consent.

Table 4.3: Operational wind turbine aviation lighting and marking summary

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
Aviation warning lighting (dual purpose for warning lights and SAR lights)	All peripheral wind turbines	• Combination 2,000cd Red and MOD specification Infrared (IR) light displayed at night, the angle of the plane of the beam of peak intensity emitted by the visible red light being elevated to between three and four degrees above the horizontal plane, with not more than 45% or less than 20% of the minimum peak intensity specified for a light of this type is to be visible at the horizontal plane and not more than 10% of the minimum peak intensity specified for a light of this type is to be visible at a depression of 1.5 degrees or more below the horizontal plane. • Visible red light dimmable to 200cd when visibility is greater than 5km in all directions at night.	Figure 4.2	ANO (CAA, 2016), CAP 764 (CAA, 2025), MOD Obstruction Lighting Guidance 2020 and MGN 654 SAR Annex 5 (MCA, 2024)

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		• Off during the day. • MOD IR requirement: 7-8nm pickup range; IR wavelength between 750nm-900nm, ideally concentrated between 800nm-850nm; 600mW/sr minimum intensity between +30° and -15° elevation at peak flash. • Synchronised flashing Morse 'W'. • Capable of either being switched off (if a lit secondary 200cd light is in place) or dimmed to 200cd, at the request of the MCA during SAR operations. • 360° visibility. • Compatibility with Night Vision Imaging System (NVIS) of IR wavelength between 800nm and 900nm. • UPS of 8 hours required to maintain all aviation warning lights, with any failure either rectified within this timeframe or a longer term		

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		solution/plan executed to ensure aviators are aware.		
Aviation warning lighting visibility meters	Selected periphery structures: [Structures to be added once final layout agreed]	• Intensity: 2,000cd when visibility < 5km in any direction. • Intensity: 200cd when visibility ≥ 5km in all directions.	N/A	CAA standard requirement and CAP 764
SAR lights	All non-peripheral wind turbines	• Combi Red 200cd / IR light. • Steady when in use at MCA request, switched off otherwise. • 360° visibility. • Compatible with NVIS of IR wavelength between 800nm and 900nm.	Figure 4.2	MGN 654 SAR Annex 5
Green heli-hoist lights	All wind turbines	• Low intensity green light. • 360° visibility. • Light off when wind turbine is not safe for heli-hoist operations. • Flashing when wind turbine is being prepared for heli-hoist operation.	N/A	CAP 437

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		• Steady when wind turbine is ready for heli-hoist operation. • Intensity: +2 to +10°: 365cd or 115cd. • Intensity: >10 to +90°: 122cd or 38cd.		
Blade markings	All wind turbines	• Three red marks (preferably dots) at 10m, 20m, and 30m intervals from the hub. • Marks to be placed near the trailing edge of the blade, allowing visibility when blades are feathered and parked at Y or offset Y (one or two blades angled forward into the wind) positions, so the marks lie upwards in view of the helicopter pilot. • At least 600 millimetres (mm) in diameter. • Direct consultation will be undertaken with the MCA if a variation to this requirement is needed.	N/A	MGN 654 SAR Annex 5
Blade tip marking	All wind turbines	• From blade tip to a point on the blade	N/A	MGN 654 SAR Annex 5

Lighting and marking aspect	Relevant structures	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
		corresponding to approximately 2% of the blade length when measured from tip. In line with MGN 654 Annex 5, the final design will be confirmed with the MCA noting lighting protection may mean the tip and part of blade leading edge cannot be painted. • Direct consultation will be undertaken with the MCA if a variation to this requirement is needed.		
ID marking	All wind turbines	• ID numbers will be marked on the wind turbine nacelle roofs. • Not less than 1.5m in height, with proportional width.	N/A	MGN 654 SAR Annex 5
Hoist area marking	Not covered within this LMP (Version 1), but should meet the standard set out in the following guidance documents, and in consultation with the appropriate authorities (CAA, NLB, and MCA): • CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2025) • CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2021 (a))			

Table 4.4: Operational Offshore Substation Platforms aviation lighting and marking summary

Lighting and marking aspect	Indicative specifications	Figure illustration	Relevant guidance or stakeholder requirement
SAR lights	• Combi Red 200 cd /IR light. • Steady when in use at MCA request, switched off otherwise. • 360° visibility. • Compatible with NVIS of IR wavelength between 800nm and 900nm.	Figure 4.2	MGN 654 SAR Annex 5
Green heli-hoist lights	• Low intensity green light. • 360° visibility. • Light off when OSP is not safe for heli-hoist operations. • Steady when OSP is ready for heli-hoist operation. • Multifunctional SAR lights to be used as green heli-hoist lights. • Intensity: +2 to +10° = 365 Cd or 115 Cd. • Intensity: >10 to +90° = 122 Cd or 38 Cd.	N/A	CAP 437
ID marking	• ID numbers will be marked on the OSP topside. • Not less than 1.5m in height with proportional width.	N/A	MGN 654 SAR Annex 5 and CAP 764
Hoist area marking	Not covered within this LMP (Version 1), but should meet the standard set out in the following guidance documents, and in consultation with the appropriate authorities (CAA, NLB, and MCA): • CAA CAP 764 – Policy and Guidelines on Wind Turbines (CAA, 2025) • CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2021 (a))		

[Figure showing operational aviation lighting and marking scheme for Morven North and Morven South to be added post-consent]

Figure 4.2: Aviation operational lighting and marking

5 Cumulative marking

5.1.1.1 Cumulative overlap of the lighting and marking aspects (for each of the construction and O&M phases) will be discussed with stakeholders (MCA, CAA, NLB and MOD) to determine any changes to the lighting and marking scheme that may be required depending on the construction schedules of each project. This may be across Morven North and Morven South or across other nearby developments such as Ossian and Bowdun.

6 Maintenance of Aids to Navigation

6.1.1.1 The following subsections summarise the maintenance associated with the AtoNs that will be installed at Morven North and Morven South.

6.2 Monitoring of Aids to Navigation on structures

6.2.1.1 Monitoring of AtoNs on structures for both functionality and availability shall be undertaken throughout the construction and O&M phases. Downtime shall be monitored remotely during the O&M phase (via the SCADA system) and visually during the construction phase. From this monitoring, the overall availability of the AtoN shall be calculated (see Section 6.5). Monitoring shall include general maintenance to ensure marine growth etc. does not impact functionality.

6.3 Monitoring of Aids to Navigation on buoyage

6.3.1.1 During construction, remote monitoring will alert the operative to the failure of a marine AtoN. Upon discovery of an extinguished AtoN, the emergency procedures outlined in Section 7 will be initiated.

6.4 Testing

6.4.1.1 Following the commissioning of all marine AtoNs, they will be tested at least once per annum. Sound signals will be equipped with functionality whereby they can be manually overridden in order to undertake annual testing.

6.5 Availability

6.5.1.1 To assist in meeting the required IALA availability standards of any given marine AtoN, remote monitoring shall be used to ensure that any faults can be rectified as soon as possible.

6.5.1.2 The data collected through remote monitoring of AtoNs shall be used to calculate the overall availability of AtoNs to ensure that IALA availability standards are being adhered to. Availabilities will be reported to NLB via their AtoN Reporting Online Portal – **https://nlbhq.nlb.org.uk/latonsonline**.

7 Emergency procedures

7.1.1.1 This section considers the emergency procedures to be initiated in the event of the loss of an AtoN, including the external protocol, trigger points for the deployment of a guard vessel and specific requirements associated with aviation lighting. In terms of external protocol, the Applicant's responsibilities in an emergency situation are generally associated with the MCA, NLB and United Kingdom Hydrographic Office (UKHO), although MD-LOT will be kept informed as the situation develops.

7.2 Loss of Aids to Navigation

7.2.1.1 Upon discovery of the loss of an AtoN which includes marine navigation lights, fog signals or buoys (or part thereof), the external protocol illustrated in Figure 7.1 will be initiated.

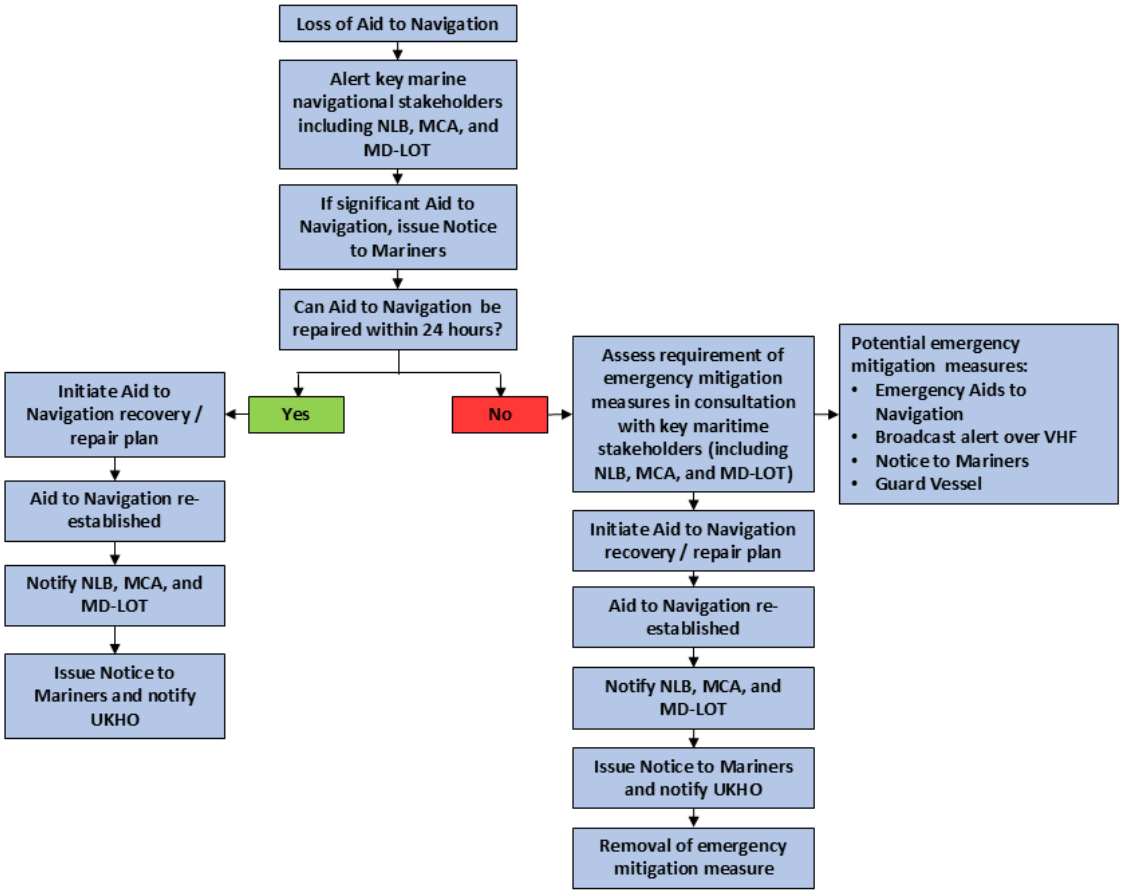

Figure 7.1: External protocol for loss of an aid to navigation

7.2.1.2 A requirement of AtoN management within UK waters is to report navigational failures to NLB. This is done through the NLB online reporting system (see Section 6.5). It is an online database administrated by NLB (as the local authority for the wind farm AtoNs) in order to assist wind farm operators to fulfil their responsibility to maintain records of AtoN availability and to provide summaries of these to NLB. This will be undertaken by the Applicant's Marine Co-ordination Centre in the event of any failures or loss of availability.

7.2.1.3 The following summarises the triggers for consultation with NLB should a key navigational aid fail.

- loss of key navigational light (i.e. primary SPS) for a period of greater than 72 hours;
- failure of sound signal for greater than 120 hours;
- loss of station of cardinal navigational mark, including significant delay (greater than 72 hours) to it being restored;
- AtoN repeatedly failing to meet IALA availability standards;
- deployment of an emergency buoy due to an unmarked hazard within Morven North or Morven South (the guard vessel would be required to monitor vessel awareness of the buoy and may then be demobilised);
- throughout significant maintenance works where an increase in navigational risk is posed (i.e. should a key SPS light have to be removed due to wind turbine maintenance).

7.2.1.4 It should be noted that the above list is not considered to be exhaustive.

7.2.1.5 In the rare event of a significant loss of one or more AtoNs, a guard vessel may be required to maintain navigational safety. Section 7.3 provides an indicative list of the trigger points that would require the Applicant to liaise with NLB and potentially implement additional emergency response mitigations (as set out in Table 7.1), which may also require informing the MCA.

7.3 Guard vessel trigger points

7.3.1.1 It is the responsibility of the operator to maintain the AtoN and provide any back-up solutions in the event of an AtoN failure. Back-up solutions may include:

- repair of a broken AtoN;
- replacement of lost AtoN;
- provision of a guard vessel.

7.3.1.2 Table 7.1 will summarise the emergency mitigation measure provision to be agreed with the MCA and NLB. These measures will include identification of the party that will be responsible for the repair or replacement of AtoN (including those on structures and navigational buoys). The information presented within Table 7.1 will be updated and confirmed pre-construction.

Table 7.1: Summary of emergency mitigation measures

Emergency mitigation measures	Organisation responsible for providing required mitigation	Relevant contact details			Service provision
		Address	Phone	Email	
[Mitigations to be added post-consent]					

7.4 Aviation lighting

7.4.1.1 The ANO states that “In the event of the failure of any light which is required by this article to be displayed by night, the person in charge must repair or replace the light as soon as reasonably practicable.”

7.4.1.2 It is accepted that there may be occasions when meteorological or sea conditions prohibit the safe transport of personnel for repair tasks. Furthermore, there may be fault conditions that are wider ranging and would take longer to diagnose or repair. In such cases, international standards and recommended practice require the issue of a Notice to Airmen (NOTAM).

7.4.1.3 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, the Applicant will request a NOTAM to be issued by informing the CAA through the Airspace Co-ordination Obstacle Management Service (ACOMS) via the CAA customer portal – **www.caa.co.uk/commercial-industry/airspace/event-and-obstacle-notification/obstacle-notification**.

7.4.1.4 The CAA requests that other obstacles are reported to the CAA even if they are below 60m, including temporary structures (e.g. cranes) or large construction vessels and meteorological masts, as this contributes to ongoing air safety initiatives for the protection of property, infrastructure and aviators. These should also be notified to the CAA using the ACOMS service. This will enable the necessary NOTAM to be generated.

7.4.1.5 To expedite the dissemination of information during active aviation operations, the Applicant may also establish a direct communication method with aviation operators in the area. The information provided will be the same as the information provided in the NOTAM, and where possible, include a NOTAM reference.

8 Decommissioning

8.1.1.1 It is agreed that the required lighting and marking of Morven North and Morven South during and following decommissioning will be agreed in consultation with NLB and the CAA at least six months prior to the decommissioning works. It may be necessary to maintain marine or aviation lighting following decommissioning if a relevant hazard remains in place (noting this would be considered unlikely but could occur where infrastructure is left in situ and poses a risk to marine and aviation users).

9 References

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