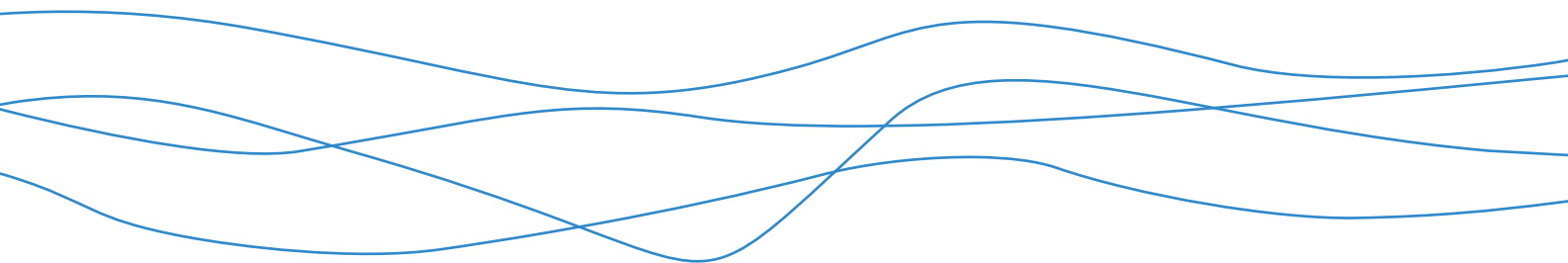




Bowdun Offshore Wind Farm, Offshore EIA Report

Volume 4, Appendix 32: Outline Aids to
Navigation Management Plan

TWP-BOW-ERM-CON-RPT-00006 | April 2026



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Glossary

Defined term	Definition
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Bowdun Offshore Wind Farm Limited (BOWFL)	A Special Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. BOWFL are the Applicant for the Offshore Application.
Civil Aviation Publication (CAP)	Guidance material and policies for the aviation industry, ensuring the safe conduct of aircraft operations. CAPs include detailed information on various aspects of aviation, such as procedures, standards, best practices, and regulatory requirements. They address both technical and operational matters.
Crown Estate Scotland (CES)	Public corporation accountable to Scottish Government, responsible for the management of land and property in Scotland owned by the monarch.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
Export Cable Corridor	The area seaward of Mean High Water Springs (MHWS) shaded in blue on Figure 1.1, which connects the Array Area with the Landfall Area within which the Offshore Export Cables will be installed.
Impact	A change caused by an action that occurs during a project's lifetime.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the Offshore Substation Platforms (OSPs).
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Marine Directorate (MD)	The Marine Directorate of the Scottish Government, formerly known as Marine Scotland. The planning and licensing authority for Scotland's seas and custodian of Scotland's National Marine Plan (NMP). The Marine Directorate - Licensing and Operations Team (MD-LOT) are specifically responsible for managing Section 36 Consent and Marine Licence Applications seaward of MHWS.
Marine Licence	A Marine Licence permits the undertaking of different activities in the marine environment, including construction, the deposition or removal of substances or objects, and dredging. The Marine (Scotland) Act 2010 requires Marine Licences to be obtained for licensable activities taking place within Scottish Territorial Seas (MHWS to 12 nm). The Marine and Coastal Access Act (MCAA) 2009 requires a Marine Licence to be obtained for licensable marine activities within the Scottish offshore region (12 nm – 200 nm).
Offshore Export Cables	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Infrastructure	All of the Offshore Infrastructure associated with the Proposed Development that is located seaward of MHWS, comprising the Offshore Generation Assets and the Offshore Transmission Assets.
Offshore Substation Platform(s) (OSPs)	OSPs comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.

Defined term	Definition
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including interconnector and IACs), scour protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, replacement of access ladders and geophysical surveys.
Plan Option Area (POA)	A location identified in the SMP as a preferred area for commercial scale offshore wind development.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Volume 1, Chapter 3: Project Description.
Scour Protection	Protective materials installed to avoid sediment being eroded away from the base of the foundations and/or buried subsea cable due to the flow of water.
Section 36 Consent	Scottish Ministers' consent under Section 36 of the Electricity Act 1989 required for the generating assets of the Proposed Development.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.
Thistle Wind Partners (TWP)	The Joint Venture (JV) of DEME Concessions, Qair Marine, and Aspiravi International.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
AIS	Aeronautical Information Service
ANMP	Aids to Navigation Management Plan
ANO	Air Navigation (Amendment) Order 2022
AtoN	Aids to Navigation
BOWFL	Bowdun Offshore Wind Farm Limited
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CES	Crown Estate Scotland
EIA	Environmental Impact Assessment
ERM	Environmental Resources Management
HAL	Highlands and Islands Airports Limited
IAC	Inter-Array Cable
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
JV	Joint Venture
LMP	Lighting and Marking Plan

Acronym	Definition
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MD-LOT	Marine Directorate - Licensing and Operations Team
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
NLB	Northern Lighthouse Board
NMP	National Marine Plan
NOTAM	Notice to Airmen
O&M	Operation and Maintenance
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
POA	Plan Option Area
SAR	Search and Rescue
SC	Subsea Collector
SCADA	Supervisory Control and Data Acquisition
SMP	Sectoral Marine Plan
SPV	Special Purpose Vehicle
TJB	Transition Joint Bay
TWP	Thistle Wind Partners

Table of Units

Units	Definition
km	Kilometre
km ²	Square kilometre

1 Introduction

1.1 Purpose of this Document

- 1.1.1 This Outline Aids to Navigation Management Plan (ANMP) has been prepared by ERM on behalf of Bowdun Offshore Wind Farm Limited (BOWFL) (hereafter referred to as the Developer) for the Bowdun Offshore Wind Farm (OWF) Project (hereafter referred to as the Proposed Development). The Proposed Development covers the Option Lease Area comprises of the Array Area, which is located in the E3 Plan Option Area (POA) detailed in the Scottish Sectoral Marine Plan (SMP) (Scottish Government, 2020), and the Export Cable Corridor. The Array Area is located 38 km from the Aberdeenshire coast at its closest point, covering an area of 187 km² (Figure 1.1). The Proposed Development will comprise of Wind Turbines (fixed foundations), Inter-Array Cables (IACs), Offshore Substation Platforms (OSPs), Interconnector Cables, Offshore Export Cables and any necessary scour/cable protection. The Export Cable Corridor will include a maximum of three High Voltage Alternating Current (HVAC) Offshore Export Cables, each with a length of up to 70 km and will make Landfall at Benholm, Aberdeenshire.
- 1.1.2 The purpose of the ANMP is to provide details of the Aids to Navigation (AtoN), including maintenance and repair of AtoN, associated with the Proposed Development, in accordance with relevant guidance, during construction and Operation and Maintenance (O&M). Decommissioning is also referenced (see Section 6), however will not be subject to the protocols outlined in this plan.
- 1.1.3 The ANMP is anticipated to be required through the Section 36 Consent and Marine Licences as a condition and therefore will be submitted to Marine Directorate – Licensing Operations Team (MD-LOT) for approval. This plan will be developed in accordance with relevant guidelines and the best practice including:
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) R139 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));
 - Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 and Annexes – Offshore Renewable Energy Installation (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021); and
 - Article 223 of the Air Navigational Order 2022 (as amended) (UK Government, 2022).

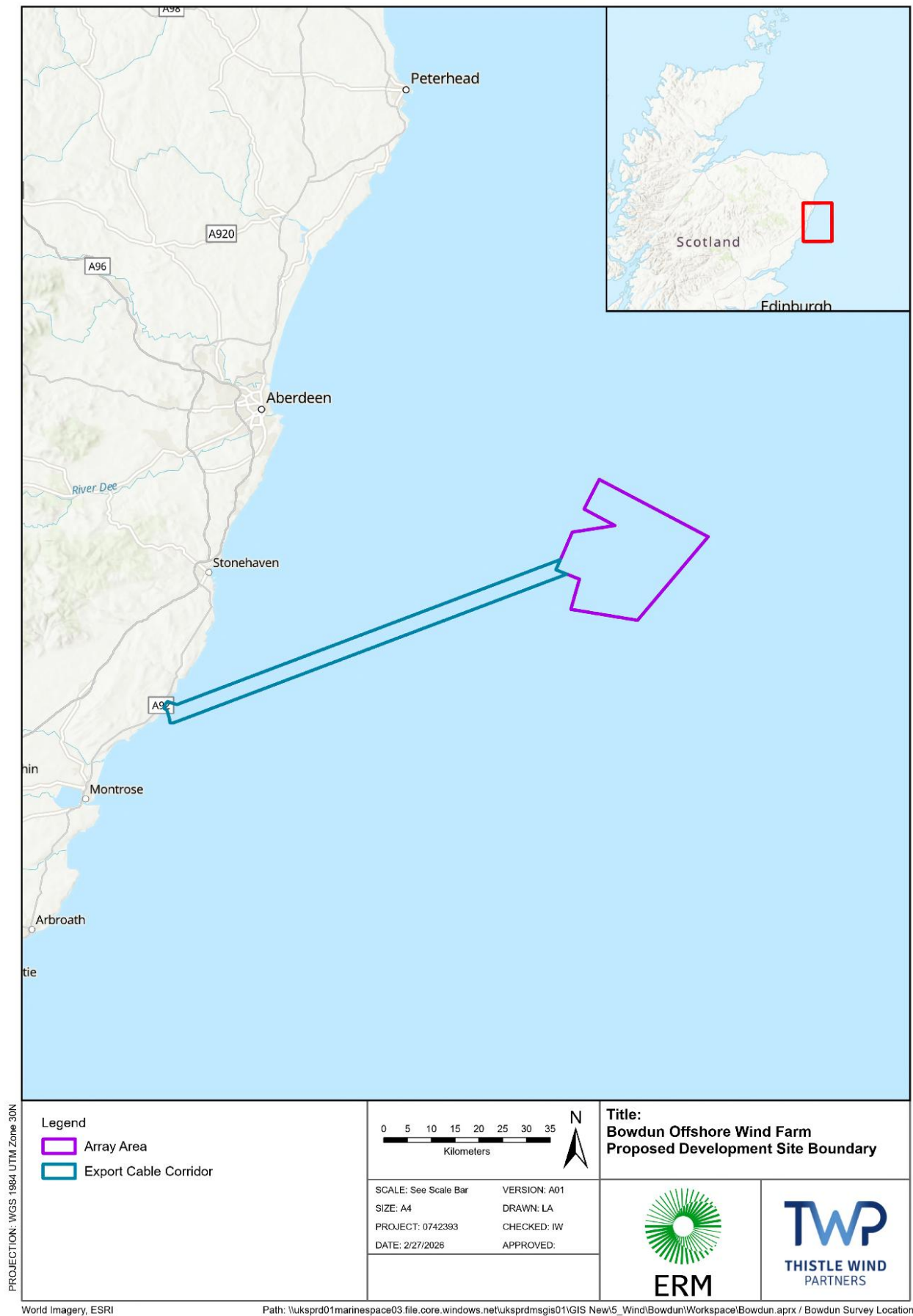


Figure 1.1: Proposed Development Site Boundary

- 1.1.4 This Outline ANMP is a ‘live’ document and as such it will be further developed pre-construction in consultation with regulatory bodies and stakeholders such as the MD-LOT, Northern Lighthouse Board (NLB), MCA, Civil Aviation Authority (CAA) and Ministry of Defence (MoD), once the project design has been finalised.
- 1.1.5 The information provided in this document is based on the current understanding of the baseline environment and how the Proposed Development will be constructed and operated using the best available technologies, in compliance with current legislation and best practice at the time of writing. Information contained within this document is accurate at the time of submission and will be reviewed as required and updated if necessary.

1.2 Other Relevant Consent Plans

- 1.2.1 This document is one of several consent plans which requires approval from MD-LOT regarding the compliance with relevant Section 36 and Marine Licence conditions.
- 1.2.2 Where additional information which is linked to this ANMP is provided in a separate document, these have been summarised in Table 1.1 below.

Table 1.1: Other Relevant Consent Plans

Relevant Plan	Link to ANMP	Relevant Section
[to be updated pre-construction]	[to be updated pre-construction]	[to be updated pre-construction]

1.3 Background

- 1.3.1 The main components of the Proposed Development, as shown in Volume 1, Chapter 3: Project Description of the Offshore Environmental Impact Assessment (EIA) Report (hereafter, ‘Offshore EIA Report’), will include:

Offshore Generation Assets

- Up to 67 Wind Turbines (each comprised of three rotor blades, a nacelle housing the generating unit, hub and tower section) and associated supporting structures which will be fixed foundations
- A network of up to 167 km of IACs which will be static cables;
- Up to 36 km of Interconnector Cables; and
- Scour Protection, cable protection and utility crossings.

Offshore Transmission Assets

- Up to three OSPs with fixed foundations and supporting infrastructure including scour protection (as required);
- Up to three Offshore Export Cables totalling approximately 210 km in length; and
- Cable protection and utility crossings where required.

- 1.3.2 A full description of the Proposed Development is provided in Volume 1, Chapter 3: Project Description of the Offshore EIA Report. However, the detailed and final design of the Proposed Development will be determined pre-construction.

1.4 Consultation

- 1.4.1 Relevant stakeholders such as MD-LOT, NLB, MCA, CAA and MoD, will be engaged with to inform the Final ANMP.
- 1.4.2 Details of this consultation will be described in this section pre-construction.

2 Marine Aids to Navigation

- 2.1.1 The Navigation Directorate at the NLB will be contacted by the Developer through the AtoN Reporting system as required throughout the construction and O&M phases of the Proposed Development. This will include notification of any requirements or notifications in relation to AtoN, including contact to sanction or remove AtoN, and to report availability.

2.2 Construction

- 2.2.1 The following sections summarise information on AtoN and lighting during the construction stage. The information provided is in line with the content of Volume 4, Appendix 31: Outline Lighting and Marking Plan (LMP).

Aids to Navigation

- 2.2.2 The construction buoys as detailed in Table 2.1 and illustrated in Figure 2.1 will be established prior to construction commencing [number of weeks prior to construction to be confirmed pre-construction]. The construction buoyage will meet the following standard specifications:

[Specifications to be added pre-construction]

Table 2.1: Construction Stage Wind Turbines Marine Lighting and Marking Summary

Buoy	ID	Latitude	Longitude	Light and Top Marking Specifications
[to be added pre-construction]				

Temporary Lights

- 2.2.3 Partially constructed Wind Turbines and OSPs, and completed structures prior to NLB sign off will display [lighting type to be added pre-construction on finalisation of the LMP] with the following specifications:

[Specifications to be added pre-construction]

- 2.2.4 NLB must be notified before temporary lights are removed. [Further details will be added pre-construction].

[Hold for Figure to be added pre-construction]

Figure 2.1: Construction Buoyage

2.3 Operation and Maintenance

- 2.3.1 The following sections summarise information on AtoN, lighting and marking during the O&M stage. The information provided is in line with the content of Volume 4, Appendix 31: Outline Lighting and Marking Plan.

Lighting and Sound Signals

- 2.3.2 The marine lighting and marking to be employed for Wind Turbines during the O&M stage of the Proposed Development are detailed in Table 2.2 and presented in Figure 2.2.

Table 2.2: O&M Stage Lighting and Marking Summary

Requirement	Guidance Document	Offshore Structure	Details
Lighting	[to be added pre-construction]	[to be added pre-construction]	[to be added pre-construction]
Marking	[to be added pre-construction]	[to be added pre-construction]	[to be added pre-construction]
Hazard Warning Signals	[to be added pre-construction]	[to be added pre-construction]	[to be added pre-construction]

- 2.3.3 The Wind Turbines and OSPs will be marked as per Appendix 31: Outline Lighting and Marking Plan. [Summary of Wind Turbine and OSPs platform paint marking information to be included pre-construction].
- 2.3.4 [If required by NLB details of buoyage requirements during the O&M stage of the offshore Project will be included here pre-construction].

[Hold for Figure to be added pre-construction]

Figure 2.2: Navigational Lighting and Marking for the O&M stage of the Proposed Development

3 Aviation Lighting

3.1 Construction

- 3.1.1 There will be no specific aviation lighting and marking during the construction stage of the Proposed Development. Any temporary obstacles, associated with the pre-assembly port or within the Array Area of more than 91.4 m in height (e.g. construction infrastructure such as cranes), will be alerted to the aviation community by means of the Notice to Airmen (NOTAM) system.
- 3.1.2 The Applicant will circulate the relevant information to the appropriate aviation authorities and stakeholders prior (e.g., Aberdeen Airport and CAA)) to and during the construction stage [to be confirmed pre-construction].

3.2 Operation and Maintenance

- 3.2.1 The following sections summarise information on lighting and marking during the O&M stage. The information provided is in line with the content of Volume 4, Appendix 31: Outline Lighting and Marking Plan [Further information will be provided pre-construction when Volume 4, Appendix 31: Outline Lighting and Marking Plan is finalised].

Normal Operations

- 3.2.2 Table 3.1 and Figure 3.1 present details of the aviation lighting to be implemented during the normal operation of the Proposed Development. Aviation lighting will be remotely controlled by the Supervisory Control and Data Acquisition (SCADA) system.

Table 3.1: Aviation Lighting During Normal Operation of the Proposed Development

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance
[to be added pre-construction]			

Search and Rescue

- 3.2.3 Each of the individual aviation Search and Rescue (SAR) lights will be controlled and monitored by the SCADA system. The SAR lights will be turned off by default, during day and night (definition of night/day as per Civil Aviation Publication (CAP) 393 (CAA, 2021) Schedule 1 (Interpretation). SAR lights will only be turned on at the MCAs request or if required for SAR operations. SAR lights may be dual function for use as green heli-hoist lights to indicate when it is safe to conduct heli-hoist operations.
- 3.2.4 SAR marine lighting and marking to be implemented during the O&M stage of the Proposed Development is summarised in Table 3.2 and Table 3.3.

Table 3.2: Wind Turbine O&M SAR Aviation Lighting

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance
[to be added pre-construction]			

Table 3.3: OSPs O&M SAR Aviation Lighting

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance
[to be added pre-construction]			

[Hold for Figure to be added pre-construction]

Figure 3.1: Aviation Lighting During O&M of the Proposed Development

4 Maintenance of Aids to Navigation

- 4.1.1 The following sections detail any required maintenance associated with the AtoN that will be installed at the Proposed Development. It is the responsibility of the Developer and/or windfarm operator to maintain the AtoN.

4.2 Monitoring

- 4.2.1 AtoN on Offshore Infrastructure will be monitored during construction and O&M stages for functionality and availability.
- 4.2.2 SCADA will be used to monitor downtime during the construction stage of the Proposed Development. During the O&M stage downtime will be monitored visually by on-site Project vessels (e.g. guard vessel) on a weekly basis, where possible. [Details to be confirmed pre-construction].
- 4.2.3 This monitoring will allow the determination of overall availability (see Section 4.4). Monitoring shall include general maintenance to ensure functionality is not impacted.
- 4.2.4 During construction of the Proposed Development, remote monitoring shall alert the operative to the failure of a marine AtoN. Upon discovery of an extinguished AtoN, the emergency procedures outlined in Section 5 shall be initiated.

4.3 Testing

- 4.3.1 Once commissioned, all AtoN will be tested at least once annually, including sounds signals.

4.4 Availability

- 4.4.1 In order to meet the required International Association of Marine Aids to Navigation and Lighthouse Authorities availability standards of any given marine AtoN, remote monitoring shall be used to ensure that any faults are resolved as soon as possible and that overall availability standards are adhered to. For navigational buoyage visual confirmation of availability will also be undertaken by Project vessels (where possible).
- 4.4.2 Availability will be reported to the NLB via their AtoN Reporting Online Portal¹.

¹ <https://nlbhq.nlb.org.uk/latonsonline>

5 Emergency Procedures

5.1 Loss of Aids to Navigation

Marine Aids to Navigation

5.1.1 Any AtoN failure will be reported by the Developer or windfarm operator to the NLB. Upon discovery of the loss of an AtoN, which includes marine navigation lights, fog signals or buoys (or part thereof), the protocol illustrated in Figure 5.1 shall be utilised.

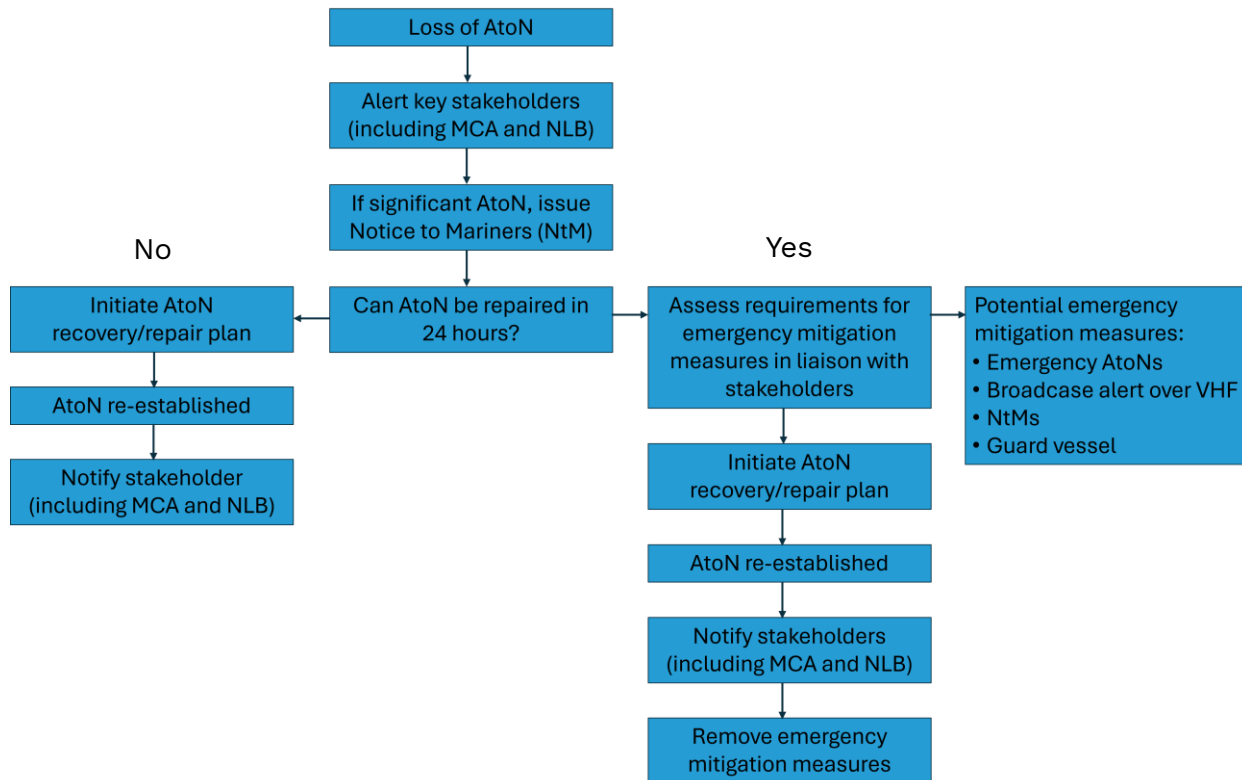


Figure 5.1: Protocol to be Employed in the Event of Loss of an AtoN

Guard Vessel Trigger Points

5.1.2 It is the responsibility of the wind farm operator to maintain the AtoN and provide any required back-up solutions in the event of an AtoN failure. This could include:

- Repair of a broken AtoN;
- Replacement of a lost AtoN; and
- Provision of a guard vessel.

5.1.3 Guard vessels can be deployed to mark hazards, provide temporary navigational aids, or assist vessels in navigating through areas where AtoN are not functioning. The specific circumstances and criteria for deploying guard vessels would depend on the nature and severity of the AtoN failure, as well as the potential impact on maritime safety and other factors e.g., metocean conditions at the time. Consultation would be undertaken with the NLB and the MCA to assess the situation and make the decision to deploy guard vessels accordingly.

- 5.1.4 Details of the emergency mitigation measures which will be in place, including the party that will be responsible for the repair or replacement of AtoN (including those on structures and navigational buoys) are presented in Table 5.1.

Table 5.1: Summary of Emergency Mitigation Measures

Emergency Mitigation Measure	Organisation responsible for providing the required mitigation measure	Address	Contact Details	Service Provision
[to be added pre-construction]				

Aviation Lighting

- 5.1.5 Article 223 (7) of the Air Navigation (Amendment) Order 2022 (ANO) states “*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.*” It is accepted that in the case of obstacles there may be occasions when meteorological or sea conditions prohibit the safe transport of staff for repair tasks. In such cases International Standards and Recommended Practices require the issue of a NOTAM.
- 5.1.6 The CAA considers the operator of an OWF is responsible for the request of a NOTAM relating to the lighting of their windfarm. Should the anticipated outage be greater than 36 hours, the windfarm operator shall request a NOTAM to be issued by informing the NOTAM section (operating 24 hours) of the UK Aeronautical Information Service (AIS) by telephoning +44 (0)20 8750 3773/3774 as soon as possible. The UK AIS will copy the details of the NOTAM to the windfarm operator and to the CAA.
- 5.1.7 Once any remedial works are completed the UK AIS shall be notified as soon as possible to enable a cancellation to be issued. If an outage is expected to last longer than 14 days, then the CAA shall also be notified directly to discuss any issues that may arise and longer-term strategies.

6 Decommissioning

- 6.1.1 The requirements for AtoN in the decommissioning stage of the Project are yet to be finalised. The requirements will be discussed and agreed with the NLB and the CAA at least six months prior to decommissioning commencing.

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