

Addendum to the
Environmental Impact
Assessment Report

NISA
North Irish Sea Array

Volume 9 - Offshore Appendices

Appendix A17.3

Lighting and Marking Plan





North Irish Sea Array Offshore Wind Farm Lighting and Marking Plan

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Presented to North Irish Sea Array Windfarm Ltd
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Revision Number	Date	Summary of Change
00	22 March 2024	Initial Draft
01	14 th May 2024	Final for Submission
02	24 th February 2026	Updated for Irish Lights Review

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Abbreviations Table

Abbreviation	Definition
AIS	Automatic Identification System
ASAM	Aeronautical Services Advisory Memorandum
AtoN	Aid to Navigation
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
cd	Candela
DoT	Department of Transport
EIAR	Environmental Impact Assessment Report
EU	European Union
HAT	Highest Astronomical Tide
IAA	Irish Aviation Authority
IALA	International Association of Marine Aids to Navigation and Lighthouse Authority
ID	Identification
IPS	Intermediate Peripheral Structure
IRCG	Irish Coast Guard
LMP	Lighting and Marking Plan
m	Metre
m2	Square Metre
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
mm	Millimetre
MSO	Marine Survey Office
NISA	North Irish Sea Array
nm	Nautical Mile
NVIS	Night Vision Imaging Systems
O&M	Operation and Maintenance
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
Radar	Radio Detection and Ranging
s	Second
SAR	Search and Rescue
SI	Statutory Instrument

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Abbreviation	Definition
SPS	Significant Peripheral Structure
UK	United Kingdom
UPS	Uninterrupted Power Supply
WGS84	World Geodetic System 1984
WTG	Wind Turbine Generator

North Irish Sea Array Windfarm Ltd (NISA, hereafter referred to as ‘the Developer’) has been considering the Request for Further Information (RFI) issued by An Bord Pleanála (now An Coimisiún Pleanála) as well as the third-party submissions received following public consultation. At An Coimisiún Pleanála’s behest, the Developer has also continued to consult with stakeholders in respect of the 2024 planning application throughout 2024-2026. The Developer has refined elements of the design to respond to the third-party submissions, the continued public and stakeholder consultation and the RFI. Amendments are therefore required to Appendix 17.3: Lighting and Marking Plan of the 2024 Environmental Impact Assessment Report (EIAR). Full details of consultation undertaken can be found in Appendix A1.2: Consultation Report. It is acknowledged there was an administrative error in the publication of the Appendices of the 2024 EIAR and the Lighting and Marking Plan is included in Appendix 17.2 although labelled incorrectly in the contents of the planning application documents as well as the document cover page.

For the purposes of clarity, this document shall be read in conjunction with the Lighting and Marking Plan submitted as part of the 2024 EIAR (Appendix 17.3: Lighting and Marking Plan). This Lighting and Marking Plan remains a live document and will be updated to reflect the current guidance and consultation with IRCG and MSO ahead and throughout the construction of the proposed development commencing.

For the purposes of clarity, any cross reference to a chapter, section, table, image, figure or appendix within this document is to another location within the Addendum to the 2024 EIAR unless explicitly stated otherwise. Any cross reference to anything included in the 2024 EIAR will be clearly labelled as such.

Text in bold is only used throughout this document to indicate where changes are required, and why they are required. Text in italics illustrates section(s) of the 2024 EIAR which are deleted, or quotations from other documents (as explicitly stated). Replacement text is in normal font. Where text has been replaced in normal font, bold text shall be used to indicate no further changes to this section (where relevant).

Only tables which have been updated from the 2024 EIAR, or entirely new tables, have been included in the Addendum to the 2024 EIAR. These tables can be identified by the “A” prefix in the table caption. Any changes within the updated table, in comparison to tables within the 2024 EIAR, are indicated by grey shading in the relevant cell, column or row, as necessary.

The sections relevant to **Appendix A17.3: Lighting and Marking Plan in the RFI** are included below.

RFI Section	RFI	Relevance to LMP
1 (b)	<p><i>The scientific information provided as part of the planning application documentation should be based on up-to-date survey reports and data. Accordingly, the applicant is requested to confirm/provide justification/verification that the information submitted in support of the planning application remains relevant and appropriate at the point of submitting further information or to update same as required.</i></p>	<p>The timeframes associated with the RFI have necessitated a review of the datasets previously used in the 2024 EIAR to ensure any necessary updates to the baseline environment are captured. However, the Marine Survey Office (MSO) confirmed <u>during a meeting in May 2025</u>, the vessel traffic survey data analysed in the 2024 EIAR was suitable for the updated NRA and so no further vessel traffic data has been collected. Therefore, a review of the baseline resources for lighting and marking features has been undertaken to comply with RFI Section 1(b).</p>
2 (a)	<p><i>The Irish Coast Guard (IRCG), through the Department of Transport, has raised concerns in relation to the layout of the proposed development with respect to search-and-rescue (SAR) access. The applicant is requested to consult with the IRCG, in addressing these concerns, and provide further information and clarification on such matters.</i></p>	<p>Continued consultation has occurred with the IRCG since the submission of the 2024 EIAR and the layouts have been revised in liaison with the IRCG in response to RFI Section 2(a) and have been reflected in this LMP. These layouts include a single line of orientation (SLoO) with a linear configuration which is accompanied by a safety justification (Appendix A17.4: North Irish Sea Array Offshore Wind Farm - Safety Justification for Single Line of Orientation Layout) in line with the requirements of Marine Guidance Note (MGN) 654. IRCG have confirmed they are content with these revisions and approach (Appendix A17.5: Irish Coast Guard Response Letter May 2026).</p>

1 Introduction

1. This Lighting and Marking Plan (LMP) sets out proposed marine and aviation lighting and marking of the offshore aspects of the North Irish Sea Array (NISA) Offshore Wind Farm development (hereafter ‘the proposed development’), a proposed offshore wind farm located in Irish waters approximately 9.5 nautical miles (nm) off the coast of Drogheda. The marine and aviation lighting and marking schemes are based on the relevant guidance and recognised industry standards as set out in Section 2, with schemes proposed for Project Options for which consent is sought by the Developer. Further details of the associated Project Options are provided in **Volume 2, Chapter 6: Description of the Proposed Development – Offshore**. In summary, the Project Options consist of:
 - **Project Option 1:** 49 Wind Turbine Generators (WTGs) with a rotor diameter of 250 metres (m) and one Offshore Substation Platform (OSP); and
 - **Project Option 2:** 35 WTGs with a rotor diameter of 276m and one OSP.
2. This LMP has been updated from that submitted as part of the 2024 Environmental Impact Assessment Report (EIAR). Key changes include:
 - Guidance outlined in Section 2 updated to account for Department of Transport (DoT) guidance published since the 2024 EIAR was submitted;
 - Guidance referenced in Table A4.1 and Table A4.2 updated accordingly; and
 - Proposed lighting and marking illustrations for Project Option 1 and Project Option 2 (marine in Section 4.1 and aviation in Section 4.2) updated to reflect updated layouts.

2 Guidance

3. This section summarises guidance that has been adhered to in this LMP in relation to both marine and aviation aspects.
4. Primary guidance for marine lighting and marking is considered to be *International Association of Marine Aids to Navigation and Lighthouse Authority (IALA) G1162* (IALA, 2021). Primary guidance for aviation obstruction lighting is considered to be *Irish Aviation Authority (IAA) Guidance Material on Off-Shore Wind Farms, Aeronautical Services Advisory Memorandum (ASAM) No 18. Issue 2* (IAA, 2015).
5. Both of these guidance documents are referenced in the *Guidance on Safety of Navigation & Emergency Response: Offshore Renewable Energy Installations (OREI)* (DoT, 2025).

2.1 Marine

6. The marine navigation lighting and marking detailed in Section 3.1 and Section 4.1 follows the following guidance documents:
 - *IALA Recommendations O-139 on the Marking of Man-Made Offshore Structures* (IALA, 2021) and *Guidance G1162 on the Marking of Man-Made Offshore Structures* (IALA, 2021);
 - *IALA R1001 – The IALA Maritime Buoyage System* (IALA, 2017); and
 - *Guidance on Safety of Navigation & Emergency Response: Offshore Renewable Energy Installations (OREI)* (DoT, 2025).

2.2 Aviation

7. The aviation lighting and marking including in relation to Search and Rescue (SAR) detailed in Section 4.2 follows the requirements set out in the following guidance documents:
 - *Civil Aviation Publication (CAP) 437 – Standards for Offshore Helicopter Landing Areas* (Civil Aviation Authority (CAA), 2021);
 - *CAP 764 – Policy and Guidelines on Wind Turbines* (CAA, 2016);
 - *IAA Guidance Material on Off-Shore Wind Farms* (IAA, 2015);
 - *Statutory Instrument. (S.I.) No. 215/2005 - IAA (Obstacles To Aircraft in Flight) Order, 2005* (IAA, 2005); and
 - *Standard Operating Procedure 07-2025 Offshore Renewable Energy Installations (OREI): Guidance and Operational Considerations for SAR and Emergency Response* (DoT, 2025).
8. CAA guidance has also been referenced where relevant. This is not described in the DoT guidance but is referenced within United Kingdom (UK) Marine Guidance Note (MGN) 654 (Maritime and Coastguard Agency (MCA), 2021) which the DoT guidance closely follows. However, the IAA guidance is applied on a primary basis.

3 Construction Phase

9. This section describes the marine (Section 3.1) and aviation (Section 3.2) lighting and marking to be implemented during the construction phase.

3.1 Marine

10. The marine lighting and marking to be implemented during the construction phase is summarised in Table A3.1, which also includes a guidance column, listing the relevant guidance/ stakeholder for each lighting and marking aspect where appropriate, noting that the guidance provides the full proposed technical specifications.
11. Figure A3.1 sets out the extent of the indicative construction buoyage area for the proposed development. Construction buoyage shall be established eight weeks prior to the proposed development commencing construction to allow time for passing traffic to familiarise with the buoyed construction area, noting this is in accordance with best practice. It is anticipated there will be no more than 12 buoys deployed to mark the construction area. The buoyage shall remain in place until the operational marking requirements have been installed, then inspected and passed by the Commissioners of Irish Lights (hereafter 'Irish Lights'). Precise buoyage locations will be as directed by Irish Lights, noting it is indicatively anticipated that may be located 1,000m from the Array Area (see Figure A3.1), outside of the proposed development.
12. The Developer will seek statutory sanction from Irish Lights in advance of the establishment, alteration, or removal of any Aid to Navigation (AtoN).

Table A3.1 Construction Phase Marine Lighting and Marking

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Temporary construction lighting	All structures	All surface piercing structures will be marked with a temporary light during construction and until operational lighting is commissioned. The temporary construction lights will have the following specification: <ul style="list-style-type: none"> ▪ Yellow 2.5 second (s) flash; ▪ At least 2nm range; and ▪ 360° visibility. 	Industry standard
Construction buoyage	Marking periphery of array area (anticipated no more than 12 buoys required)	The array construction area will be marked with a mixture of cardinal and special marks, as directed by Irish Lights. The construction buoyage will have the following specification: <ul style="list-style-type: none"> ▪ Lighting colour and sequence as per standard buoy requirements; ▪ At least 5nm range; ▪ Some buoys may require Automatic Identification System (AIS) transmitters; and ▪ Buoys will be located as directed by Irish Lights but anticipated to be within 1,000m of the array area. 	<ul style="list-style-type: none"> ▪ <i>IALA R1001 – The IALA Maritime Buoyage System (IALA, 2017)</i>

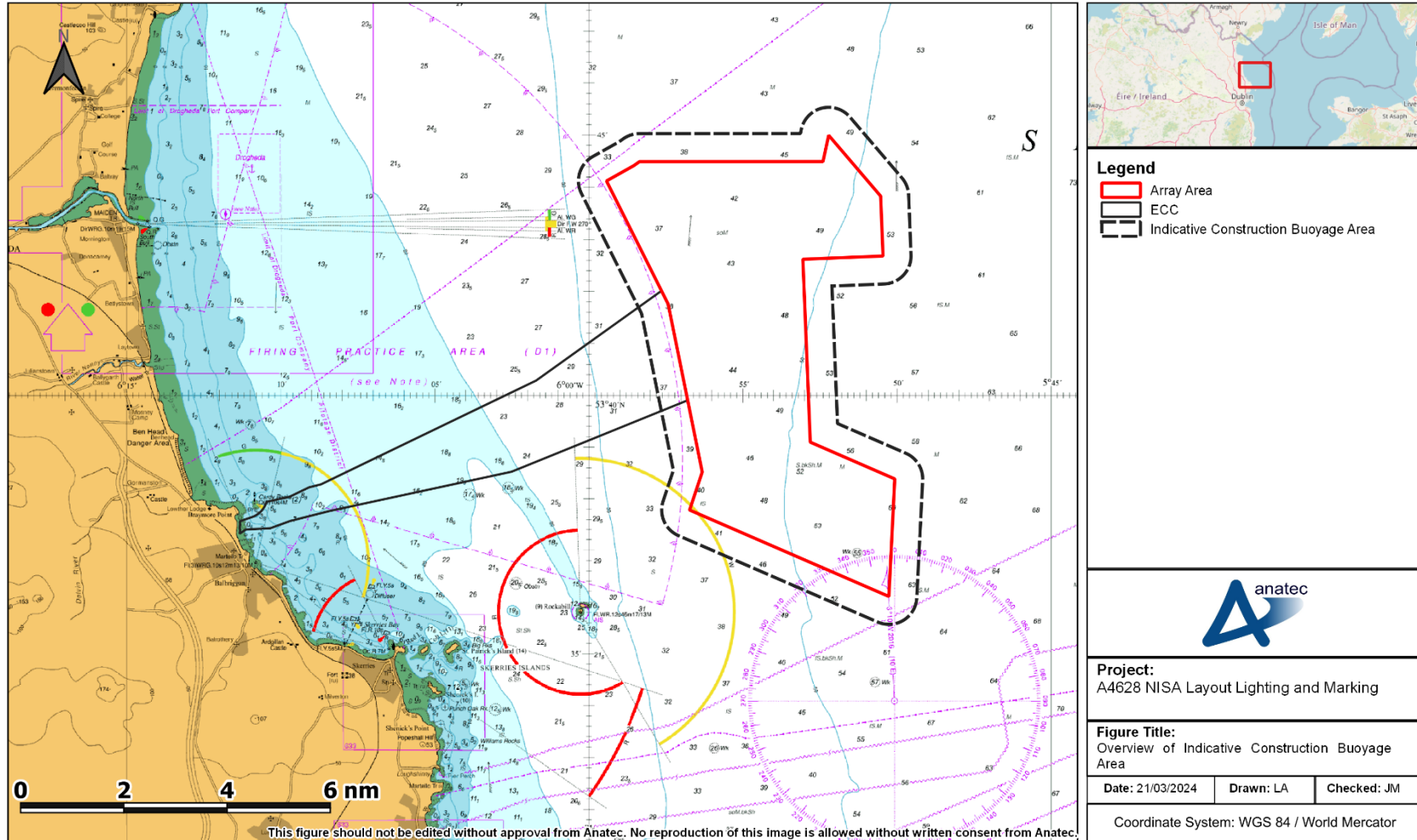


Figure A3.1 Overview of Indicative Construction Buoyage Area

3.2 Aviation

13. There will be no specific aviation lighting and marking implemented during the construction phase; however, relevant information on the proposed development will be provided to aviation stakeholders. In particular, as required under S.I.215 (IAA, 2005), the IAA will be notified of any enroute obstacles (including mobile cranes) above 45m in height, giving at least 30 days' notice.
14. The following details will be provided:
 - Geographic latitude;
 - Geographic longitude;
 - Elevation; and
 - Height.
15. In line with ASAM No 18 (IAA, 2015), at least three months in advance of the installation of structures, the following information will be supplied to the IAA:
 - Positional data representing the estimated position of each machine or structure (WTGs and OSP) to be erected. The geodetic datum to which all obstructions shall be referred is the World Geodetic System 1984 (WGS84). Coordinates will be provided in degrees, minutes, seconds and decimals of a second, as appropriate;
 - The estimated maximum elevation of each structure (WTG and OSP) in feet and metres;
 - Proposed lighting details for each structure;
 - Proposed marking details for each structure;
 - Whether it is proposed that a Radio Detection and Ranging (Radar) enhancer/transponder/ reflector or Radar/ AIS is fitted;
 - Minimum and maximum spacing between structures (WTGs and OSP);
 - Planned earliest date of erection; and
 - Any other information considered relevant for air navigation.

4 Operation and Maintenance Phase

16. This section presents the marine (Section 4.1) and aviation (Section 4.2) lighting and marking to be implemented during the operation and maintenance (O&M) phase.

4.1 Marine

17. The marine operational lighting and marking to be implemented are summarised in Table A4.1. These include a guidance column listing the relevant guidance/stakeholder for each lighting and marking aspect where appropriate, noting that this guidance provides the full technical specifications required by the relevant stakeholders. The proposed marine lighting and marking is then illustrated for Project Option 1 and Project Option 2 in Figure A4.1 and Figure A4.2 respectively.
18. Since the OSP is located on the periphery it may be deemed a Significant Peripheral Structure (SPS) or Intermediate Peripheral Structure (IPS) and will be subject to the same requirements detailed in Table A4.1 as for any WTG selected as an SPS or IPS. For Project Option 1 and Project Option 2 the proposed OSP location does not require a light given the position relative to other structures. However, this will be confirmed by Irish Lights pre construction.
19. The Developer will seek statutory sanction from Irish Lights in advance of the establishment, alteration, or removal of any AtoN and the operational lighting and marking will be confirmed with Irish Lights once the as built structure locations are confirmed.

4.1.1 Failure of Marine Lighting

20. The Developer will ensure that appropriate redundancy and/ or back up capability is utilised to ensure the appropriate IALA availability categories as set out in Table A4.1 are met. In the event of a significant loss of an AtoN such that a significant risk to navigation is considered likely to occur, consultation shall be undertaken with Irish Lights, Irish Coast Guard (IRCG), and the Marine Survey Office (MSO) to determine the need for any additional mitigation which may include promulgation of navigational warnings, deployment of temporary AtoNs or use of a guard vessel.

Table A4.1 O&M Phase Marine Lighting and Marking Summary

Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
SPSs	Selected peripheral structures, noting not all peripheral structures will carry marine AtoN	Marine lights marking selected periphery WTGs as required under IALA. The SPSs will have the following specification: <ul style="list-style-type: none"> ▪ Yellow 5s flash <i>*Not specified in IALA but UK best practice;</i> ▪ At least 5nm range; ▪ 360° visibility; ▪ Synchronised; ▪ Located not less than 6m and not more than 30m above Highest Astronomical Tide (HAT) and below the lowest point of any arc of rotor blades; ▪ At least IALA Category 2; and ▪ At least 96 hours back up/ Uninterrupted Power Supply (UPS) capability. 	IALA G1162 (IALA, 2021).
IPSS	Selected peripheral structures not already marked as SPSs, noting not all peripheral structures will carry marine AtoN	Marine lights marking selected periphery WTGs as required under IALA. The IPSs will have the following specification: <ul style="list-style-type: none"> ▪ Yellow 2.5s flash <i>*Not specified in IALA but UK best practice;</i> ▪ At least a 2nm range; ▪ 360° visibility; ▪ Synchronised; ▪ Located not less than 6m and not more than 30m above HAT and below the lowest point of any arc of rotor blades; ▪ IALA Category 2; and ▪ At least 96 hours back up/ UPS capability. 	IALA G1162 (IALA, 2021).

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Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
Sound signals	Selected SPSs	<p>The sound signals will have the following specification:</p> <ul style="list-style-type: none">▪ Blast every 30s lasting 2s;▪ At least 2nm range;▪ 360° audibility;▪ Each WTG with a sound signal installed will also have to have a visibility meter/ detector;▪ Located not less than 6m and not more than 30m above HAT; and▪ IALA Category 3.	<ul style="list-style-type: none">▪ IALA G1162 (IALA, 2021); and;▪ Use as directed by Irish Lights.
AIS	Selected SPSs	At least IALA Category 3.	IALA G1162 (IALA, 2021).
Identification marker boards (ID)	All structures	<p>ID system will be agreed with Irish Lights and IRCG, under IALA requirements:</p> <ul style="list-style-type: none">▪ ID panels with black letters on yellow background;▪ Letters 1m high;▪ Visibility in all directions; and▪ Use of either illumination or retroreflective material, noting any illumination will be hooded/ baffled to avoid confusion with AtoN.	IALA G1162 (IALA, 2021).
WTG paint	All WTGs	<ul style="list-style-type: none">▪ Foundations painted yellow (RAL 1023) all round from HAT to a height of at least 15m above HAT; and▪ Remainder of structures painted light grey (RAL 7035).	<ul style="list-style-type: none">▪ IALA G1162 (IALA, 2021); and;▪ Industry standard.

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Lighting and Marking Aspect	Relevant Structures	Specifications	Relevant Guidance or Stakeholder Requirements
OSP paint	OSP	<ul style="list-style-type: none">▪ Foundations painted yellow (RAL 1023 or similar) all round from HAT to a height of at least 15m above HAT; and▪ Remainder of structures painted light grey (RAL 7035 or similar) excluding topside structures such as work cabins, cranes, etc.	<ul style="list-style-type: none">▪ IALA G1162 (IALA, 2021); and;▪ Industry standard.

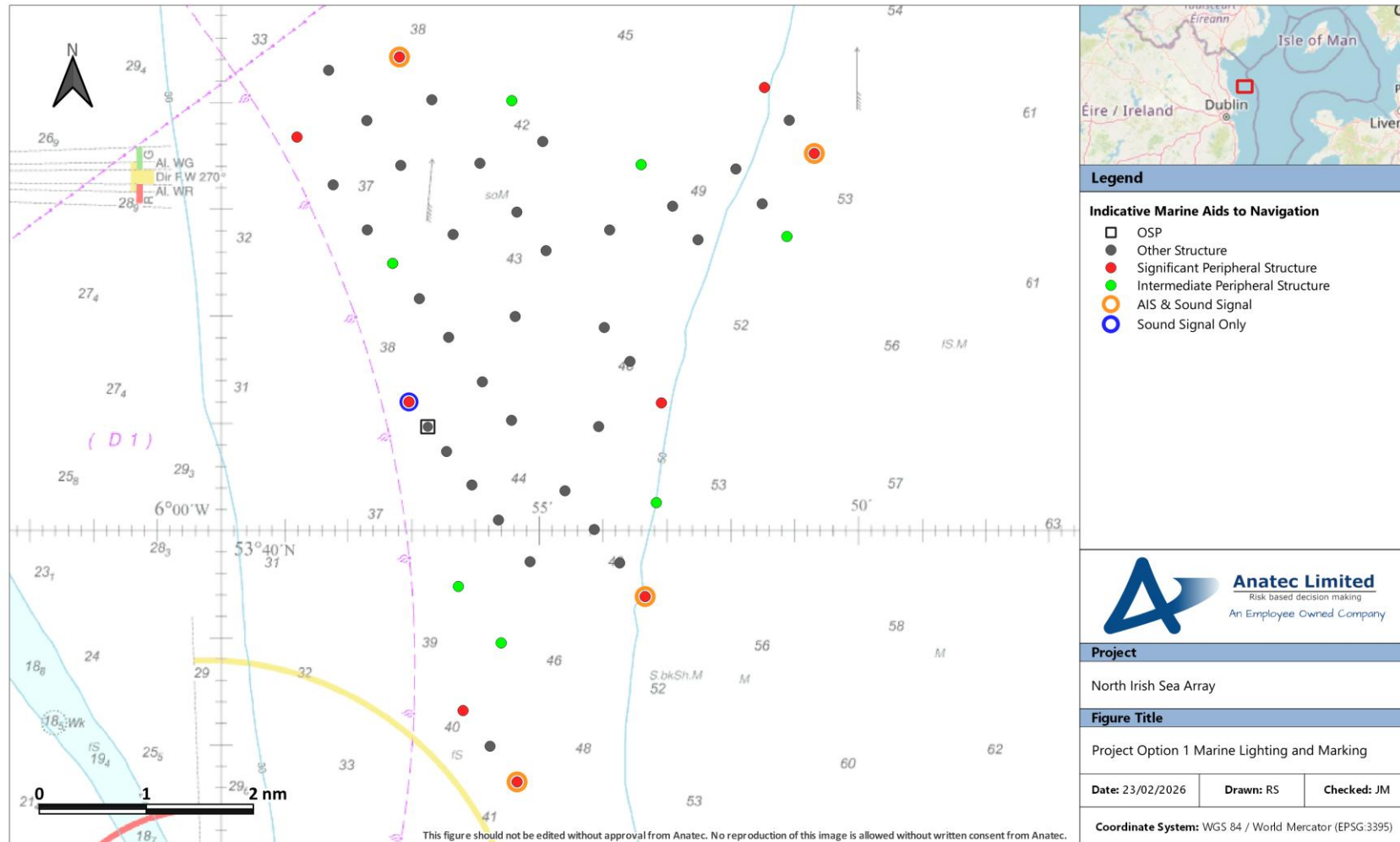


Figure A4.1 Project Option 1 Marine Lighting and Marking

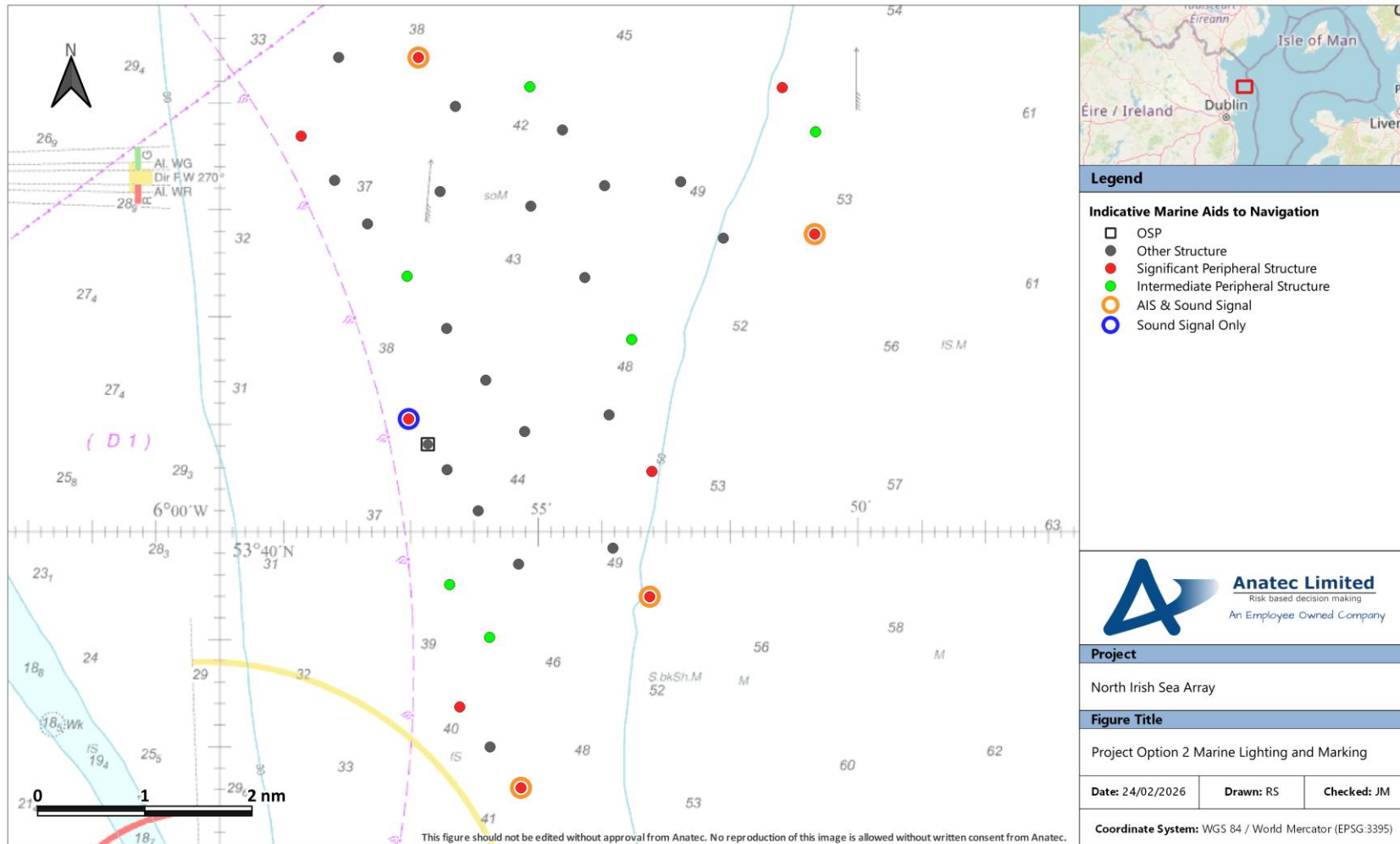


Figure A4.2 Project Option 2 Marine Lighting and Marking

4.2 Aviation

21. The aviation operational lighting and marking to be implemented are summarised in Table A4.2. These include a guidance column listing the relevant guidance/ stakeholder for each lighting and marking aspect where appropriate, noting that this guidance provides the full technical specifications required by the relevant stakeholders. The proposed aviation lighting and marking is then illustrated for Project Option 1 and Project Option 2 in Figure A4.3 and Figure A4.4, respectively.
22. Since the OSP is located on the periphery it may be subject to the same requirements detailed in Table A4.1 as for any WTG on the periphery.
23. The key applicable IAA guidance is ASAM No 18 (IAA, 2015) which provides aviation lighting requirements for offshore wind farms.

4.2.1 Failure of Aviation Lighting

24. ASAM No 18 (IAA, 2015) states that *“any light which fails shall be repaired or replaced as soon as is reasonably practicable. An alerting system for light failure will be put in place, such as remote monitoring or other suitable method agreeable to the IAA”*. Appropriate maintenance and reporting procedures will therefore be discussed and agreed with the IAA.

Table A4.2 O&M Phase Aviation Lighting and Marking Summary

Lighting and Marking Aspect	Relevant Structures	Specification	Relevant Guidance or Stakeholder Requirements
Hazard warning lights	All peripheral structures	<p>In accordance with the International Civil Aviation Organisation Annex 14 standards, on a 24-hour basis, for High Intensity Type A lighting will be required. The hazard warning lights will have the following specification:</p> <ul style="list-style-type: none"> ▪ Mounted on the highest point practicable of the structure; ▪ White with flash rate of 40-60 flashes per minute; ▪ Effective intensity of: <ul style="list-style-type: none"> ▪ 200,000 candela (cd) ± 25% when background luminance above 500cd per square metre (m²); ▪ 20,000cd ± 25% when background luminance between 50 and 500cd/m²; and ▪ At least 2,000 cd when background luminance below 50cd/m². ▪ Light fittings baffled so that practically no light will be emitted below the horizontal, or as otherwise agreed with the IAA; ▪ All lights across the array should flash in synchronisation and reductions in light intensity should occur simultaneously if practicable; and ▪ Visible through 360° in azimuth. 	<ul style="list-style-type: none"> ▪ ASAM No 18 (IAA, 2015) ▪ IAA have indicated that there are potential intentions to align with the approach taken in the wider European Union (EU) or in the UK. Given that the DoT guidance closely resembles MGN 654 (MCA, 2021) as detailed in Section 2, UK requirements for aviation lighting under CAA CAP 764 (CAA, 2016) are provided for reference in Appendix A.
SAR lights	All structures	<p>SAR lighting is an MCA requirement for UK projects under MGN 654. Specifications shown as per MGN 654:</p> <ul style="list-style-type: none"> ▪ 200cd red light, steady when in use off otherwise; 	MGN 654 (MCA, 2021)

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Lighting and Marking Aspect	Relevant Structures	Specification	Relevant Guidance or Stakeholder Requirements
		<ul style="list-style-type: none">360° visibility; andCompatible with Night Vision Imaging Systems (NVIS).	
SAR blade markings	All WTGs	Specification under Standard Operating Procedure 07-2025: <ul style="list-style-type: none">Red marks (preferably dots) at 10, 20 and 30m from hub end;Displayed near trailing edge of blades;Contrasting colour to blades, recommended red (RAL 3020);Minimum 600 millimetres (mm) in diameter however may need to be larger dependent on overall size, shape of turbine and blades; andBlade tip also marked in red (RAL 3020), approximately 2% of blade length.	Standard Operating Procedure 07-2025 (DoT, 2025)
Marine ID panels	All structures	Specification under Standard Operating Procedure 07-2025: <ul style="list-style-type: none">ID numbers will be marked on the WTG nacelle roofs;ID system will be agreed with Irish Lights and IRCG; andNot less than 1.5m height, with proportional width.	Standard Operating Procedure 07-2025 (DoT, 2025)
Hoist area markings	Intended that UK standards under CAP 437 (CAA, 2023) will be applied, if agreed with IAA.		

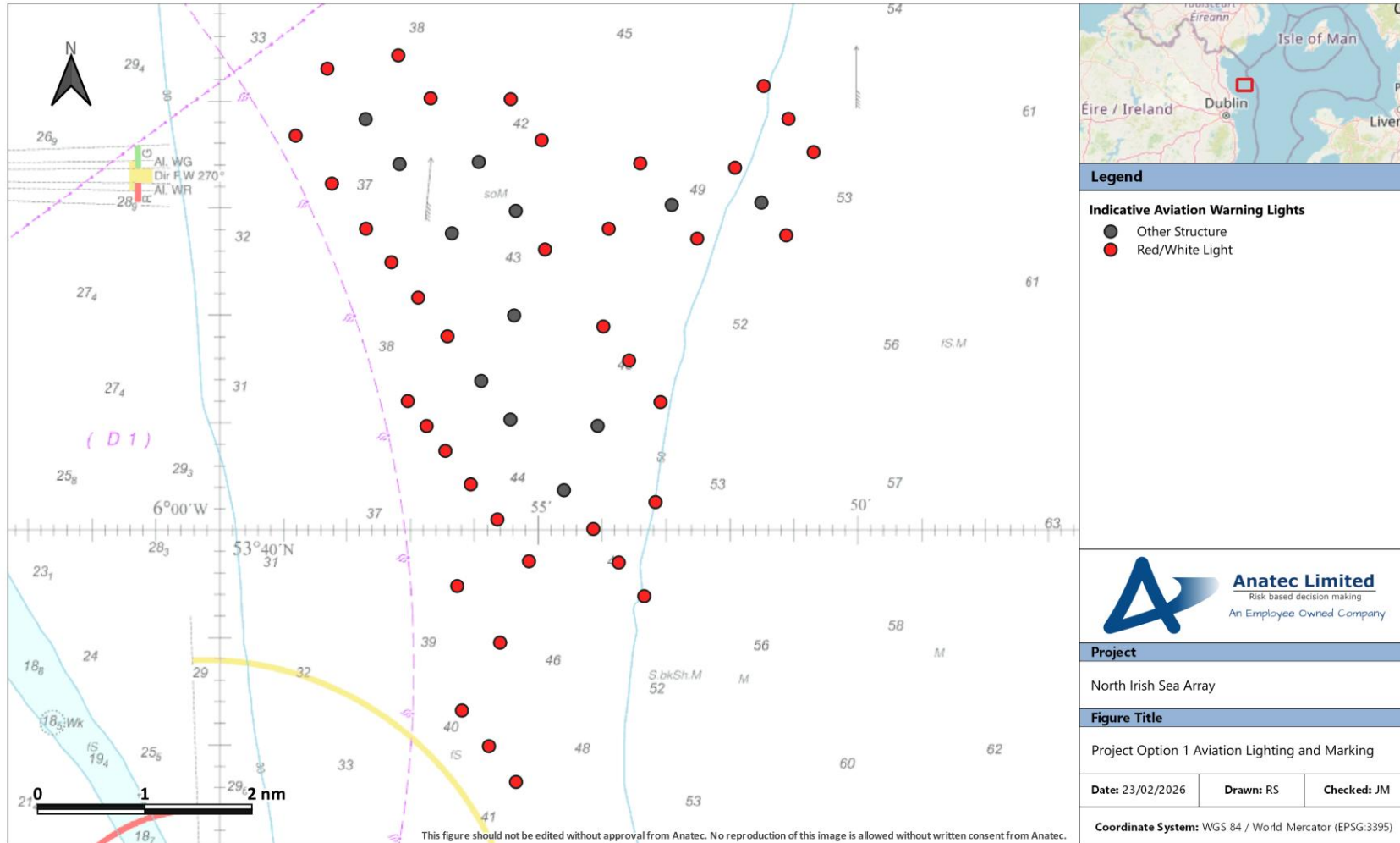


Figure A4.3 Project Option 1 Aviation Lighting and Marking

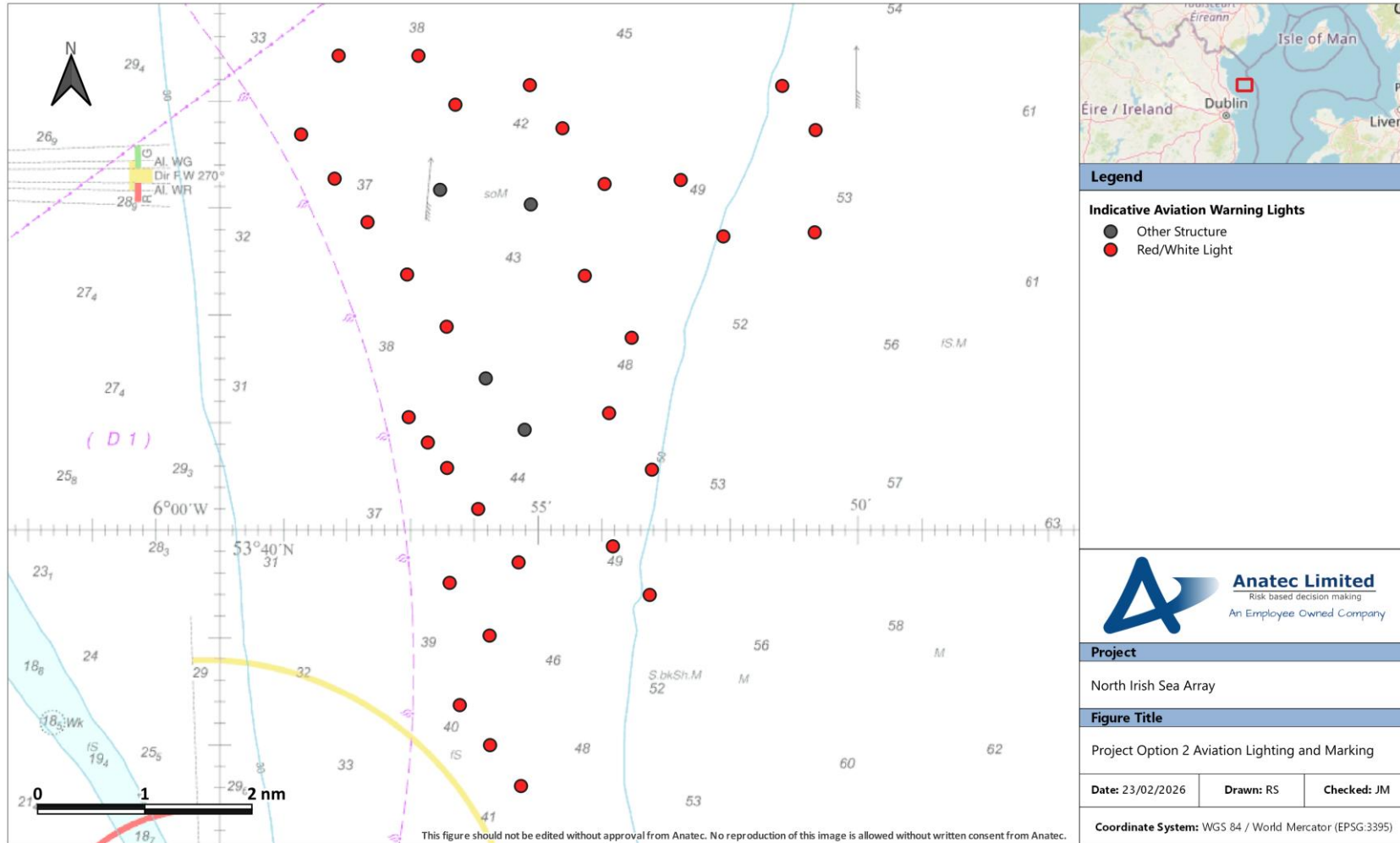


Figure A4.4 Project Option 2 Aviation Lighting and Marking

5 References

CAA (2016). *The Air Navigation Order*. Crawley, England: CAA.

CAA (2016). *CAP 764 Policy and Guidelines on Wind Turbines*. Crawley, England: CAA.

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IALA (2021). *Guidance G1162 on the Marking of Man-Made Offshore Structures*. Saint Germain en Laye, France: IALA.

MCA (2021). *MGN 654 (M+F) Offshore Renewable Energy Installations safety response*. Southampton: MCA.

Appendix A UK CAA Aviation Hazard Lighting Requirements

25. Given that Irish offshore wind farm guidance closely resembles MGN 654 (MCA, 2021) as detailed in Section 2, but is not yet finalised, a summary of UK requirements for aviation hazard lighting under CAA CAP 764 (CAA, 2016) is detailed as follows:

- Red 2,000 cd light displayed at night¹.
- Dimmable to 200cd when visibility is greater than 5km at night.
- Off during the day.
- Synchronised flashing Morse 'W'².
- 360° visibility.
- Compatibility with NVIS.
- If agreed with CAA, lights located only on periphery structures. Such lighting, where achievable, shall be spaced at longitudinal intervals not exceeding 900m.
- UPS of eight hours required to maintain all aviation warning lights³

¹ Definition of night / day as per Air Navigation Order (CAA, 2016).

² Industry standard, from CAP 764: "To resolve concerns from the maritime community, work has been undertaken to develop an aviation warning lighting standard which is clearly distinguishable from maritime lighting. Where it is evident that the default aviation warning lighting standard (article 220) may generate issues for the maritime community, a developer can make a case, that is likely to receive CAA approval, for the use of a flashing red Morse Code Letter 'W' instead".

³ Not specified in CAP 764, but recognised as the industry standard and a CAA requirement.