

Project Title	Seagreen Wind Energy Ltd
Document Reference Number	LF000009-CST-OF-PLN-0010

Lighting and Marking Plan

Section 36 Consent Condition 19 and Offshore Transmission Asset (OTA) Marine
Licence Condition 3.2.2.14

For the approval of Scottish Ministers

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Consent Plan Overview

Purpose of the Lighting and Marking Plan

This Lighting and Marking Plan (LMP) is submitted by Seagreen Wind Energy Limited (SWEL) on behalf of Seagreen Alpha Wind Energy Limited (SAWEL) (hereinafter referred to as Seagreen) to address the specific requirements of the relevant conditions attached to:

(1) the Section 36 (S36) Consents granted by the Scottish Ministers to SAWEL under section 36 of the Electricity Act 1989 (in respect of the Alpha Offshore Wind Farm) and to Seagreen Bravo Wind Energy Limited (SBWEL) (in respect of the Bravo Offshore Wind Farm) on 10 October 2014 both as varied by the Scottish Ministers by decision letter issued pursuant to applications under section 36C of the Electricity Act 1989 on 28 August 2018, 10 October 2022 and 20 December 2022 and, in respect of the consent applicable to the Bravo Offshore Wind Farm, as assigned to SAWEL on 22 November 2019; and

(2) OTA Marine Licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 on 10 October 2014, as amended by the revised marine licences granted by the Scottish Ministers on 6 March 2019 (reference 04678/19/0) and 10 October 2022 (MS-00010078) in respect of the Seagreen Offshore Transmission Assets (OTA) associated with the Seagreen Alpha and Seagreen Bravo Wind Farms (OWFs);

for the Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs) and their associated Offshore Transmission Assets (OTA).

Seagreen Alpha and Seagreen Bravo OWFs and the OTA are collectively referred to as the 'Seagreen Project'. This LMP has been prepared to discharge consent conditions for the Seagreen Project simultaneously.

The overall aims and objectives of the LMP are to set out the lighting and marking scheme that will be implemented for the Seagreen Project, to include the OWFs and the OTA during both the construction and operational phases. This includes both marine and aviation lighting and marking.

All Seagreen Contractors (including their subcontractors) involved in the Seagreen Project are required to comply with this LMP through conditions of contract.

Scope of the LMP

This LMP covers, in line with the requirements of the consents conditions, and in line with industry standards and good practice, the following:

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

Structure of the LMP

The LMP is structured as follows:

- | | |
|---------------|---|
| Section 1 & 2 | Provides an overview of the Project and the consent requirements that underpin the content of this LMP. It also sets out the purpose, objectives and scope of the LMP and sets out the process for making updates and amendments. |
| Section 3 | Details the aviation lighting and marking of the Seagreen Project during the construction and operational phases. |
| Section 4 | Details the marine lighting and marking of the Seagreen Project during the construction and operational phases. |
| Section 5 | Demonstrates compliance with the original application and commitments made. |
| Section 6 | Lists the references made within this Report |
| Appendices | Appendix A – Abbreviations and Definitions
Appendix B – Change Management Process
Appendix C – Compliance with ES Parameters
Appendix D – Summary Mitigation Measures |

Plan Audience

This LMP will be submitted for approval to the Scottish Ministers/Licensing Authority in consultation with other stakeholders in relation to monitoring compliance with the specific requirements of the relevant consent conditions.

Compliance with this LMP will be monitored by: Seagreen's Ecological Clerk of Works (ECOW); Seagreen's appointed Contractors; and the Marine Scotland Licensing and Operations Team (MS-LOT).

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

- Seagreen's head office;
- Seagreen's construction office and Marine Coordination Centre; and
- at the premises of any Contractor (as appropriate), including the Seagreen ECoW, appointed by Seagreen.

1. Introduction

1.1 Consents and Licences

Seagreen Wind Energy Limited (hereafter referred to as 'Seagreen') was awarded Section 36 Consents (S36 Consents) under the Electricity Act 1989 by Scottish Ministers in October 2014 for Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs). The S36 consents were varied by the Scottish Ministers pursuant to applications under s36C of the Electricity Act 1989 on 28 August 2018, 10 October 2022 and 20 December 2022 and the S36 Consent applicable to the Bravo Offshore Wind Farm was assigned to SAWEL on 22 November 2019. Marine Licences for Seagreen Alpha and Bravo OWF and the Offshore Transmission Asset (OTA) (together the 'Marine Licences') were also awarded by the Scottish Ministers in October 2014 under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 (all subsequently varied). Together the wind farms Seagreen Alpha and Seagreen Bravo and the OTA collectively comprise 'the Seagreen Project'.

In addition, an additional ML was granted in November 2019 providing an alternative landfall installation method (subsequently varied). On 12 December 2019, the Bravo Marine Licence was transferred from the name of Seagreen Bravo Wind Energy Limited (SBWEL) into the name of Seagreen Alpha Wind Energy Limited (SAWEL).

1.2 Project Description

The Seagreen Project is located in the North Sea, in the outer Firth of Forth and Firth of Tay region and comprises the OWFs (WTGs, their foundations, and associated array cabling), together with associated infrastructure of the OTA (Offshore Substation Platforms (OSPs), their foundations and the offshore export cable), to facilitate the export of renewable energy to the national electricity transmission grid. The location of the Seagreen Project is shown in Figure 1.1.

The Seagreen Project will consist of the following key components:

- 150 WTGs comprising;
 - 114 WTGs installed on three legged steel jackets, each installed on suction bucket caissons ('Stage 1');
 - 36 WTGs - foundation type to be determined ('Stage 2');
- Two OSPs, each installed on up to 12 pin pile foundations;
- A network of inter-array subsea cables as detailed below, inter array cables will be buried where possible and where burial is not possible cable protection will be provided.
 - Circa 355km of inter-array cables to connect strings of WTGs together and to connect the WTGs to the OSPs
 - Circa 3km of interconnector cable to connect the two OSPs
- Three subsea export cables, totalling circa 190km in length, to transmit electricity from the OSP to the landfall at Carnoustie and connecting to the onshore export cables for transmission to the onshore substation and connection to the National Grid network. Export cables will be buried where possible and where burial is not possible cable protection will be provided.

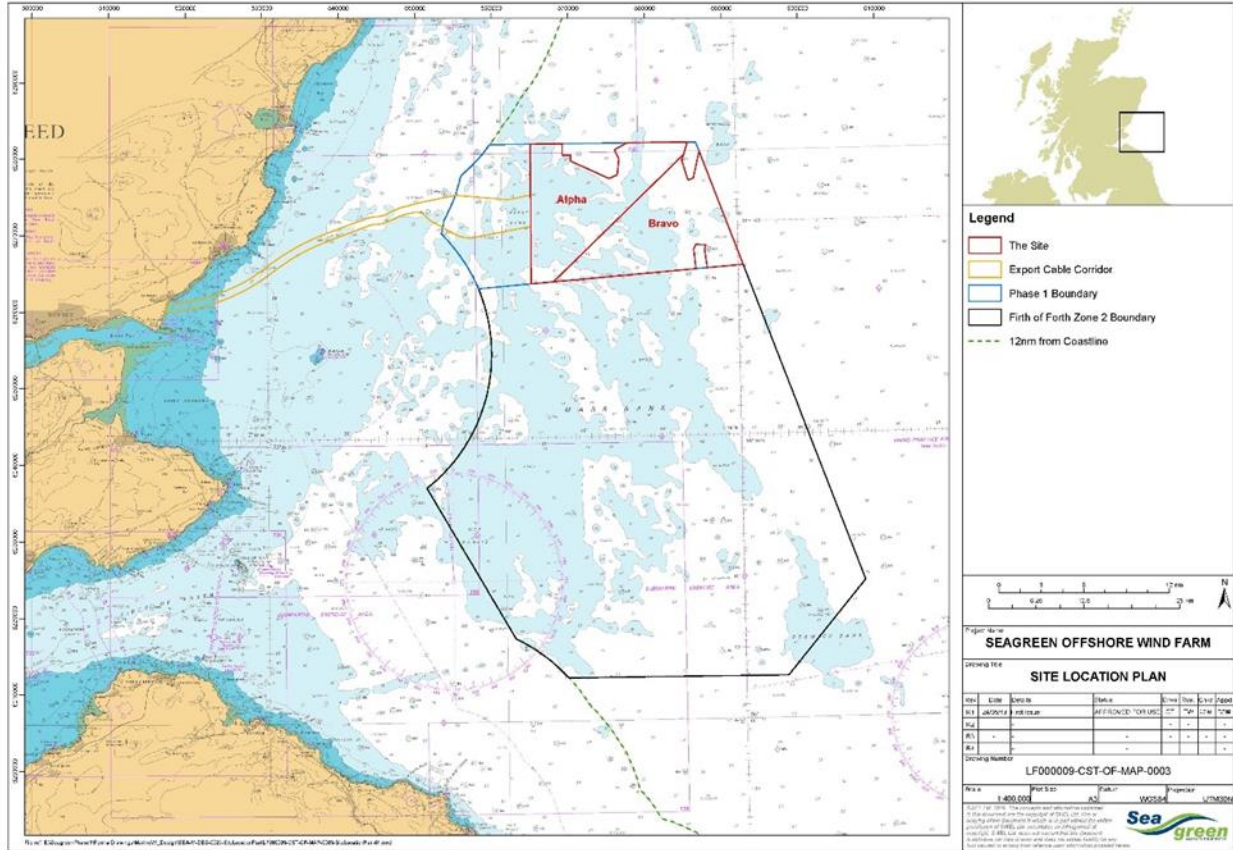


Figure 1.1 Project Location

1.3 Consent and Licence Requirements

This LMP has been prepared to discharge Condition 19 of the S36 Consents and part of Condition 3.2.2.14 of the OTA Marine Licence, as set out in Table 1.1.

Table 1.1- LMP Consent Conditions to be discharged by this LMP

Consent Document	Condition Reference	Relevant Condition Text	Reference to relevant Section of this LMP
Section 36	Condition 19	The Company must, no later than 6 months prior to the Commencement of the Development, submit an LMP, in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with the Maritime Coastguard Agency (“MCA”), Northern Lighthouse Board (“NLB”), the Civil Aviation Authority (“CAA”), the Ministry of Defence (“MOD”) and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.	Rev01 of the LMP was submitted to the Scottish Ministers as required. The necessary consultation as undertaken and subsequent revisions of the LMP reflect comments received where appropriate.
		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 said guidance prior to the approval of the LMP.	As per Section 3.1 (aviation) and 4.1 (marine), the relevant guidance has been applied.
		The LMP must also detail the navigational lighting requirements detailed in International Association of Marine Aids to Navigation and Lighthouse Authority (IALA) Recommendation O-139 or any other documents that may supersede said guidance prior to approval of the LMP.	As per Section 3.1 (aviation) and 4.1 (marine), the relevant guidance has been applied.
		The Company must provide the LMP, for information only, to the Planning Authorities, the Joint Nature Conservation Committee (“JNCC”), Scottish Natural Heritage (“SNH”) and any other bodies as may be required at the discretion of the Scottish Ministers.	The LMP will be supplied to the parties requested by the Scottish Ministers.
		The Development must, at all times, be constructed and operated in accordance with the approved LMP (as updated and amended from time to time by the Company).	The Project will comply with the contents of this LMP as required.
		Any updates or amendments made to the LMP by the Company must be submitted, in writing, by the Company to the Scottish Ministers for their written approval.	See Section 1.5.

Consent Document	Condition Reference	Relevant Condition Text	Reference to relevant Section of this LMP
Marine Licence (OTA)	3.2.2.14	[...] The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a LMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with MCA, NLB, CAA, MOD and any such other advisors as may be required at the discretion of the Licensing Authority.	Rev01 of the LMP was submitted to the Scottish Ministers as required. The necessary consultation as undertaken and subsequent revisions of the LMP reflect comments received where appropriate.
		The LMP must provide that the Works be lit and marked in accordance with the current MCA, CAA and MOD navigational and 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 said guidance prior to the approval of the LMP.	As per Section 3.1 (aviation) and 4.1 (marine), the relevant guidance has been applied.
		The LMP must also detail the navigational lighting requirements detailed in IALA Recommendations O-139 or any other documents that may supersede said guidance prior to approval of the LMP.	As per Section 3.1 (aviation) and 4.1 (marine), the relevant guidance has been applied.
		The LMP must make provision for the marking and lighting of the OSPs to be amended as required by NLB or the CAA in the event that the OSPs are constructed prior to the construction of wind turbine generators forming part of the Seagreen Alpha and Seagreen Bravo Wind Farm within the Site so that the marking and lighting of any OSP suits the layout of wind turbine generators located within the Site.	As per Section 4.3.1, all structures (including the OSPs) will be marked with temporary construction lighting until commissioning. The site will also be marked via buoyage during the construction phase as per Section 4.3.2.
		The Licensee must provide the LMP to the Angus Council, Fife Council, the JNCC, SNH and any other bodies as may be required at the discretion of the Licensing Authority.	The LMP will be supplied to the parties requested by the Scottish Ministers.

In addition to the specific consent requirements for the development of a LMP, as set out in Table 1.1, this LMP also includes information to discharge a number of other consent conditions which are linked to the requirements of lighting and marking. These are set out in Table 1.2.

Table 1.2 Other Consent Conditions relevant to this LMP

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this LMP
Marine Licence (OWF)	3.2.2.4	The Licensee must ensure that the Works are marked and lit in accordance with the requirements of the NLB, the CAA and the MOD at all times and such marking and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 72 of the 2009 Act.	As per Section 3.1 and 4.1, the relevant NLB, CAA and MOD guidance has been considered within this LMP.
		The Licensee must not display any marks and lights additional to those required by virtue of this licence and agreed in the Meteorological Mast(s) Lighting and Marking plan (MMLMP) without the written approval of the Licencing Authority following consultation with the NLB, the CAA, the MOD and the MCA.	Seagreen will only display such lighting and marking that has been approved within this LMP, or that has been subsequently granted approval. See Section 4.2.1. No meteorological masts are to be installed within the site.
		The Licensee must ensure that the meteorological masts, should they be built in the Site, are marked and lit in accordance with IALA Recommendation O-139 prior to approval of the MMLMP.	No meteorological masts are to be installed within the site.
		The Licensee must ensure the Site boundaries are marked by Cardinal Mark buoys (number to be determined when final layout is known). The Cardinal Mark buoys shall be a minimum of 3 metres (m) in diameter at the waterline, have a focal plane of at least 3 m above the waterline and be of suitable construction for the sea conditions commonly experienced in the Outer Firth of Forth. The light range on these buoys shall be 5 nautical miles (nm). All required buoyage shall remain in place until completion of this phase, or otherwise notified by the Licensing Authority.	See Section 4.3.2.
		The Licensee must ensure that any meteorological mast(s) within the Site area will have marking and lighting amended to suit the layout of the wind farm as it progresses should the meteorological mast(s) be built prior to the WTGs.	No meteorological masts are to be installed within the site.

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this LMP
	3.2.2.5	The Licensee must ensure that any vessels permitted to engage in the Works are marked in accordance with the International Rules for the Prevention of Collisions at Sea whilst under way, and in accordance with the United Kingdom (UK) Standard Marking Schedule for Offshore Installations if secured to the seabed.	See Section 4.3.3.
	3.2.3.4	The Licensee must ensure that the Works are marked and lit in accordance with the requirements of the NLB, the CAA and MOD at all times and such marking and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 72 of the 2009 Act.	As per Section 3.1 (aviation) and 4.1 (marine), the relevant guidance has been considered.
		The Licensee must ensure that the required IALA availability target for Category 1 Aids to Navigation (AtoN) is achieved through redundancy, monitoring and repair, must be in place and arrangements made to warn the mariner promptly of any AtoN fault and its subsequent return to fully operational service.	See Section 4.5.
		The licensee must ensure that the meteorological mast, should it be required, is marked and lit in accordance with IALA Recommendation O-139 prior to approval of the MMLMP.	No meteorological masts are to be installed within the site.
		The Licensee must ensure that any meteorological mast(s) within the Site will have marking and lighting amended to suit the final layout of the wind farm.	No meteorological masts are to be installed within the site.
Marine Licence (OTA) and Marine Licence (OWF)	3.2.2.14 3.2.1.3	The Licensee must, as soon as reasonably practicable prior to Commencement of the Works, notify the UKHO of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications through the national Notice to Mariners (NtM) system.	See Section 4.2.

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this LMP
		The Licensee must, as soon as reasonably practicable prior to the Commencement of the Works, ensure that local mariners, fishermen's organisations and HM Coastguard, in this case Maritime Rescue Coordination Centre Aberdeen are made fully aware of the Licensable Marine Activity through local Notice to Mariners or any other appropriate means. The Licensee must consult with any local Harbour Master where appropriate, who may wish to issue local warnings to alert those navigating in the vicinity to the presence of the Works during construction.	See Section 4.2.
		The Licensee must ensure that details of the Works are promulgated in the Kingfisher Fortnightly Bulletin, as soon as reasonably practicable prior to the Commencement of the Works to inform the Sea Fish Industry of the vessel routes, the timings and the location of the Works and of the relevant operations.	See Section 4.2.
		The Licensee must prior to Commencement of the Works, complete an "Application for Statutory Sanction to Alter/Exhibit" form and submit this to the NLB for the necessary sanction to be granted. [...]	See Section 4.2.
Marine Licence (OTA)	3.2.3.5	[...] The works shall be marked and/or lighted as required by the NLB and the marking to be continued unless and until the Licensing Authority rescind this direction.	The Seagreen Project will be lit and marked in accordance with this LMP which shall be agreed with the NLB.
		If it is desired to display any marks or lights not required by this licence then details must be submitted to the NLB and their ruling complied with. The display of unauthorised marks or lights is prohibited.	The Seagreen Project will be lit and marked in accordance with this LMP which shall be agreed with the NLB. As per Section 4.2.1, Seagreen will seek NLB statutory sanction prior to exhibiting, amending, or removing any AtoN.

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this LMP
Marine Licence (OTA)	3.2.3.6	The Licensee must ensure that the works are marked and lit in accordance with the requirements of the NLB and the CAA at all times and such marking and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 30 of the 2010 Act and under section 72 of the 2009 Act.	The Seagreen Project will be lit and marked in accordance with this LMP which shall be agreed with the NLB and CAA.
		The Licensee must ensure that no marks or lights, other than those required by virtue of this licence, are displayed unless they have been approved, in writing, by the Licensing Authority following consultation with the NLB and the CAA.	The Seagreen Project will be lit and marked in accordance with this LMP which shall be agreed with the NLB and CAA. As per Section 4.2.1, Seagreen will seek NLB statutory sanction prior to exhibiting, amending, or removing any AtoN.
		The Licensee must ensure site boundaries are marked by Cardinal Mark buoys (number to be determined when the final layout of the [OTA] is known). The Cardinal Mark buoys shall be a minimum of 3 m in diameter at the waterline, have a focal plane of at least 3 m above the waterline and be of suitable construction for the sea conditions commonly experienced in the Outer Firth of Forth. The light range on these buoys shall be 5 nm. All required buoyage shall remain in place until Completion of this phase or otherwise notified by the Licensing Authority.	See Section 4.3.2 for details of the agreed construction buoyage.
		In the event that OSPs are constructed prior to the construction of wind turbine generators forming part of Seagreen Alpha and Seagreen Bravo Offshore Wind Farms, the Licensee must ensure that the marking and lighting of any OSP is such that it can be amended to suit the layout of wind turbine generators located within the Site as specified in the LMP.	As per Section 4.3.1, all structures (including the OSPs) will be marked with temporary construction lighting until commissioning. The site will also be marked via buoyage during the construction phase as per Section 4.3.2.

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this LMP
Marine Licence (OTA)	3.2.3.7	The Licensee must ensure that any vessels permitted to engage in the Works are marked in accordance with the International Rules for the Prevention of Collisions at Sea whilst under way, and in accordance with the UK Standard Marking Schedule for Offshore Installations if secured to the seabed.	See Section 4.3.3.
Marine Licence (OTA)	3.2.4.6	The Licensee must ensure that the Works are marked and lit in accordance with the requirements of the NLB, CAA and MOD at all times and such marking and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 30 of the 2010 Act and under section 72 of the 2009 Act.	The Seagreen Project will be lit and marked in accordance with this LMP which shall be agreed with the NLB and CAA. As per Section 4.2.1, Seagreen will seek NLB statutory sanction prior to exhibiting, amending, or removing any AtoN.
		The Licensee must ensure that the required IALA availability target for Category 1 Aids to Navigation (“AtoN”) is achieved through redundancy, monitoring and repair, must be in place and arrangements made to warn the mariner promptly of any AtoN fault and its subsequent return to fully operational service.	See Section 4.5.
		The Licensee must ensure that lit Cable Marker Boards (CMBs) are positioned as near as possible to the shoreline so as to mark the points at which the cables come ashore. The CMBs shall be diamond shaped, with dimensions 2.5 m long and 1.5 m wide, background painted yellow with the inscription ‘Cables’ painted horizontally in black. The structures shall be mounted at least 4 m above ground level, with a navigation light flashing yellow once every five seconds (“Flash (FI) Yellow(Y) 5 seconds (s)”) mounted on the upward apex of the board. The nominal range of these lights should be 3 nautical miles, and they should have an availability of not less than 97% (IALA Category 3) over a rolling three year period. It will be acceptable to screen the navigation light to landward.	Following consultation with the NLB, it has been confirmed that Cable Marker Boards are not required for the Project (see Section 4.4.7).

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this LMP
		The Licensee must ensure that the marking and lighting of any OSP is amended in accordance with the LMP to suit the final layout of the wind turbine generators forming part of the Seagreen Alpha and Seagreen Bravo Offshore Wind Farms located within the Site.	See Section 4.4.6 for OSP marking.
Marine Licence (Alternative Cable Installation)	3.1.1	The Licensee must ensure that, where the Works authorised by the licence are carried on as an alternative to nearshore cable laying operations under marine licence number 04678/14/0, that the works authorised by the licence are appropriately covered in the plans submitted under marine licence number 04678/14/0. Such plans are PEMP, EMP, DP, CoP, CMS, VMP, NSP, CaP, OMP, LMP and PS, as required by conditions 3.2.1.1, 3.2.1.2, 3.2.1.7, 3.2.2.3, 3.2.2.4, 3.2.2.8, 3.2.2.9, 3.2.2.10, 3.2.3.2, 3.2.2.14, and 3.2.2.5 of marine licence number 04678/14/0.	This LMP is compliant with relevant conditions as per Table 1.1 and Table 1.2.
	3.2.1	[...]The Licensee must, no later than one calendar month prior to the Commencement of the Works, complete an “Application for Statutory Sanction to Alter / Exhibit” form and submit this to the NLB for the necessary sanction to be granted. 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 via e-mail to navigation@nlb.org.uk for the necessary sanction to be granted prior to exhibiting, altering or discontinuing navigational lighting. [...]	See Section 4.2.1.
		[...]The Licensee must ensure that any vessels permitted to engage in the Works are marked in accordance with the International Rules for the Prevention of Collisions at Sea 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 4.3.3.

1.4 Linkages with other consent plans

Section 36 Consent Condition 19 and Marine Licence Condition 3.2.2.14 do not explicitly identify linkages between this and other Consent Plans. However, other conditions require that several Consent Plans be consistent with the LMP including the CMS, NSP, VMP and OMP.

1.5 Updates and Amendments

Should any updates to this LMP become necessary, the change management process for any updates required to the LMP including resubmission of consent plans for approval, is outlined in Appendix B – The LMP Change Management Procedure.

2. Scope and Objectives of the LMP

This LMP has been prepared to address the specific requirements of the relevant conditions attached to the S36 Consents and OTA Marine Licence issued to Seagreen as set out in Table 1.1 and Table 1.2.

The overall objective of this LMP is to set out the lighting and marking scheme that will be implemented for the Seagreen Project. The LMP applies to both the construction phase of the Project, including lighting and marking of temporary or part-built fixed structures and the operational phase of the project, including additional associated buoyage. Consultation has been undertaken with the NLB, MCA, and the CAA on lighting and marking and this has informed the development of this LMP.

The LMP has the following primary functions based on the requirements set out in the S36 and Marine Licences:

- i. to ensure the Seagreen Project is lit and marked in accordance with requirements under IALA O-139 and the requirements of the MCA, NLB, CAA, and the MOD;
- ii. to ensure sub structures are effectively marked in addition to the WTGs; and
- iii. to ensure details of the lighting and marking scheme are passed on to the relevant stakeholders, at the discretion of the Scottish Ministers.

All Seagreen personnel and Seagreen's Contractors (including their Sub-Contractors) involved in the Seagreen Project must comply with the LMP.

3. Aviation Lighting and Marking

3.1 Introduction

This section sets out how the Seagreen Project will be marked and lit from an aviation (including Search and Rescue (SAR)) perspective. The aviation lighting and marking scheme has been agreed with the CAA and MCA, and has been designed to be in compliance with the relevant guidance in force at the time the scheme was designed and first approved, which is as follows:

- CAP 764 CAA Policy and Guidelines on Wind Turbines (CAA, 2016);
- CAP 437 Standards for Offshore Helicopter Landing Areas (CAA, 2018);
- CAP 393 Air Navigation: The Order (ANO) and the Regulations (CAA, 2019);
- MCA Offshore Renewable Energy Installations (OREI): Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response. Annex 5 of MGN 543 (MCA, 2018) [noting that this has since been superseded by Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response. Annex 5 of MGN 654 (MCA, 2021)]; and
- MCA OREI Emergency Response Cooperation Plans (ERCoP) for Construction and Operation Phase, and Requirements for Emergency Response and SAR Helicopter Operations (MCA, 2019).

3.2 Promulgation of Information

Seagreen will ensure effective promulgation of information to the appropriate aviation authorities and stakeholders throughout the construction and operational phases of the project.

There is an international civil aviation requirement for all structures (temporary or otherwise) of 300 feet (91.4 m) or more to be charted on aeronautical charts. The appropriate locations will therefore be reported to the Defence Geographic Centre (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.

As per CAA requirements, Seagreen will provide the DGC with accurate locations of the WTGs, accurate maximum heights, the lighting status of the WTGs and the estimated start / end dates for construction together with an estimate as to when the WTGs are scheduled to be removed.

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, Seagreen 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.

Promulgation of information in relation to aviation lighting failures / emergency reporting are detailed in Section 3.5.

3.3 Construction Phase

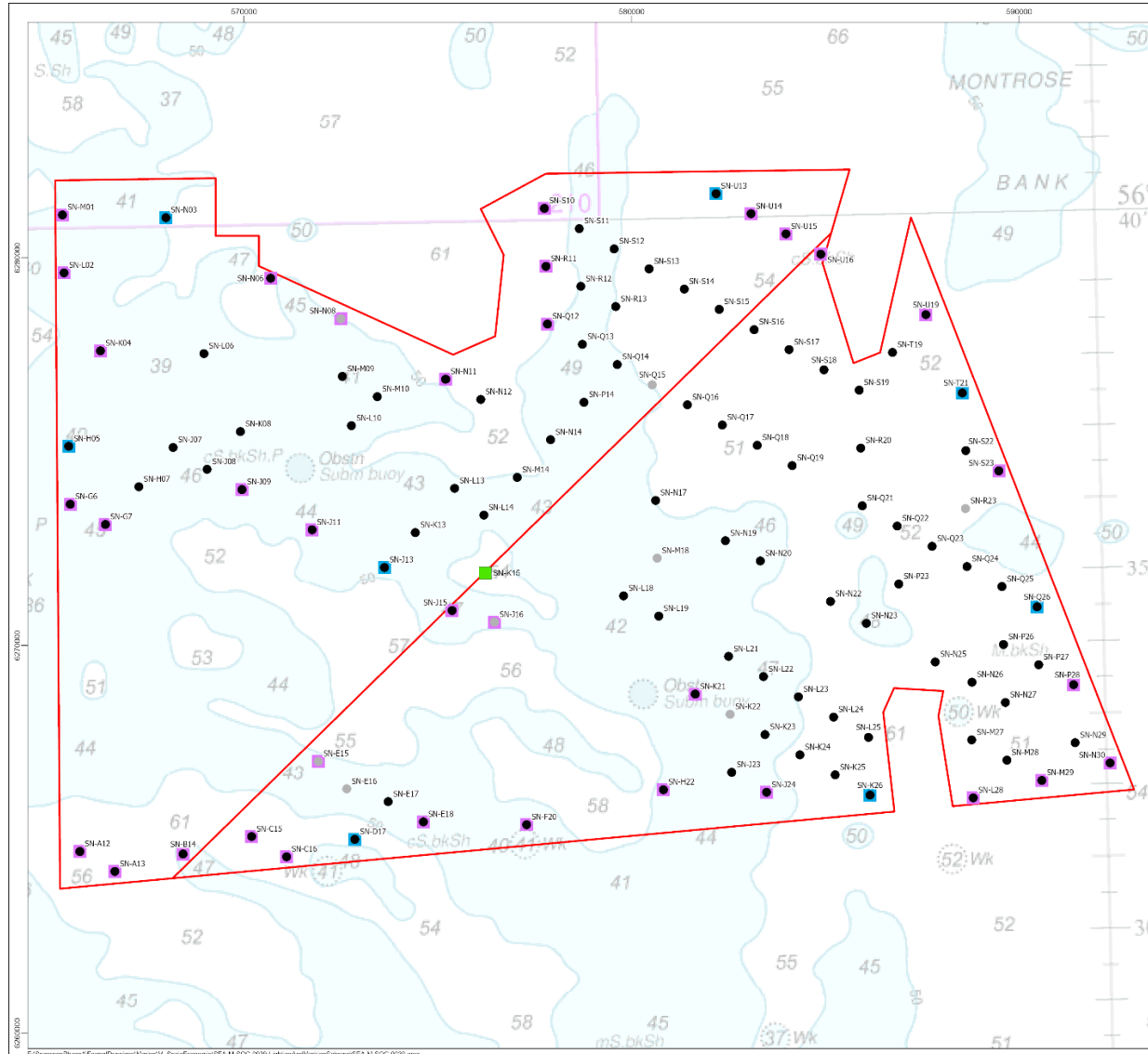
No specific aviation lighting or marking will be implemented during the construction phase. As per Section 3.2, Seagreen will undertake promulgation of information to the relevant aviation authorities and stakeholders prior to, and during construction.

3.3.1 Interim Construction Stage

It is noted that there will be a time gap between the installation of the WTGs on suction bucket foundations (Stage 1) and the WTGs in Stage 2. During this time period, Stage 1 WTGs will be commissioned and begin generating. Consultation with the CAA has indicated that since Stage 1 WTGs will be generating, additional WTGs will need to be lit via aviation hazard lighting during any such time period and until the point of final commissioning of all WTGs. Following final commissioning of all WTGs, the proposals set out in Section 3.4.1 would supersede the interim lighting scheme.

The proposed interim scheme is presented in Figure 3.1. The aviation hazard lights fitted to the periphery Stage 1 WTGs would be lit as per Section 3.4.1. Further, an additional eight WTGs will also be fitted with aviation hazard lights, which will display as required until final commissioning. Following final commissioning, the operational scheme set out at section 3.4.1 will be implemented.

The eight additional "internal" WTGs which will be lit via aviation hazard lights during the interim stage are SN-E15, SN-G07, SN-J09, SN-J11, SN-J13, SN-J15, SN-J16 and SN-K21. SN-J13 will also be fitted with a visibility meter.



Legend

- Site Boundary
- Seagreen Layout (114)
 - Turbine Location Confirmed (106)
 - Turbine Location Confirmed (Utilised Spare) (8)
 - OSP
- Aviation Lighting
 - 2000cd Light
 - 2000cd Light and Visibility Meter

Rev	Date	Status	Drawn	Checked	App'd
01	14/03/2014	Issue for Comment			
02	14/03/2014	Issue for Comment			
03	14/03/2014	Issue for Comment			
04	20/09/2012	Issue for Comment			

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Project: **SEAGREEN**

Title: **AVIATION LIGHTING INTERIM SCENARIO**

Scale: 1:95,000

Drawing Number: **SEA-M-SOC-0039-01**

Sheet No.: **001 OF 001**

Figure 3.1 - Aviation Lighting Interim Construction Scenario

3.4 Operational Phase

3.4.1 Lighting / Obstruction Marks

During the operational phase, each periphery WTG will be fitted with 2000 cd red aviation lights, flashing Morse 'W'. These lights will be dimmable to 200 cd when visibility is greater than 5 km. Additionally, all structures (i.e., including internal WTGs and the OSPs) will be fitted with a dual purpose 200 cd red SAR light / green heli hoist status light.

On this basis the operational aviation lighting scheme to be implemented is shown in Figure 3.2, with precise specifications set out in Table 3.1.

Visibility meters will be fitted to eight periphery WTGs (see Figure 3.2 and Table 3.1) to detect when visibility is greater than 5 km, in which case the light intensity of the aviation hazard lights will be automatically reduced from 100% to 10%. If any WTG detects that visibility is less than 5 km, all aviation hazard lights will increase intensity to 2,000 cd.

Note that the interim lighting scenario has been revised to reflect an amended array layout necessitated by the use of spare WTG locations during Stage 1 construction. This was subject to consultation with CAA. It is noted that the operational lighting and marking scheme does not account for the potential use of spare locations in Stage 2. In the event that a spare location is used, consultation would be undertaken with the CAA to confirm whether any changes to the scheme are necessary. This approach has been agreed with the CAA and was successfully implemented for the use of spare locations in Stage 1 (see Figure 3.1).

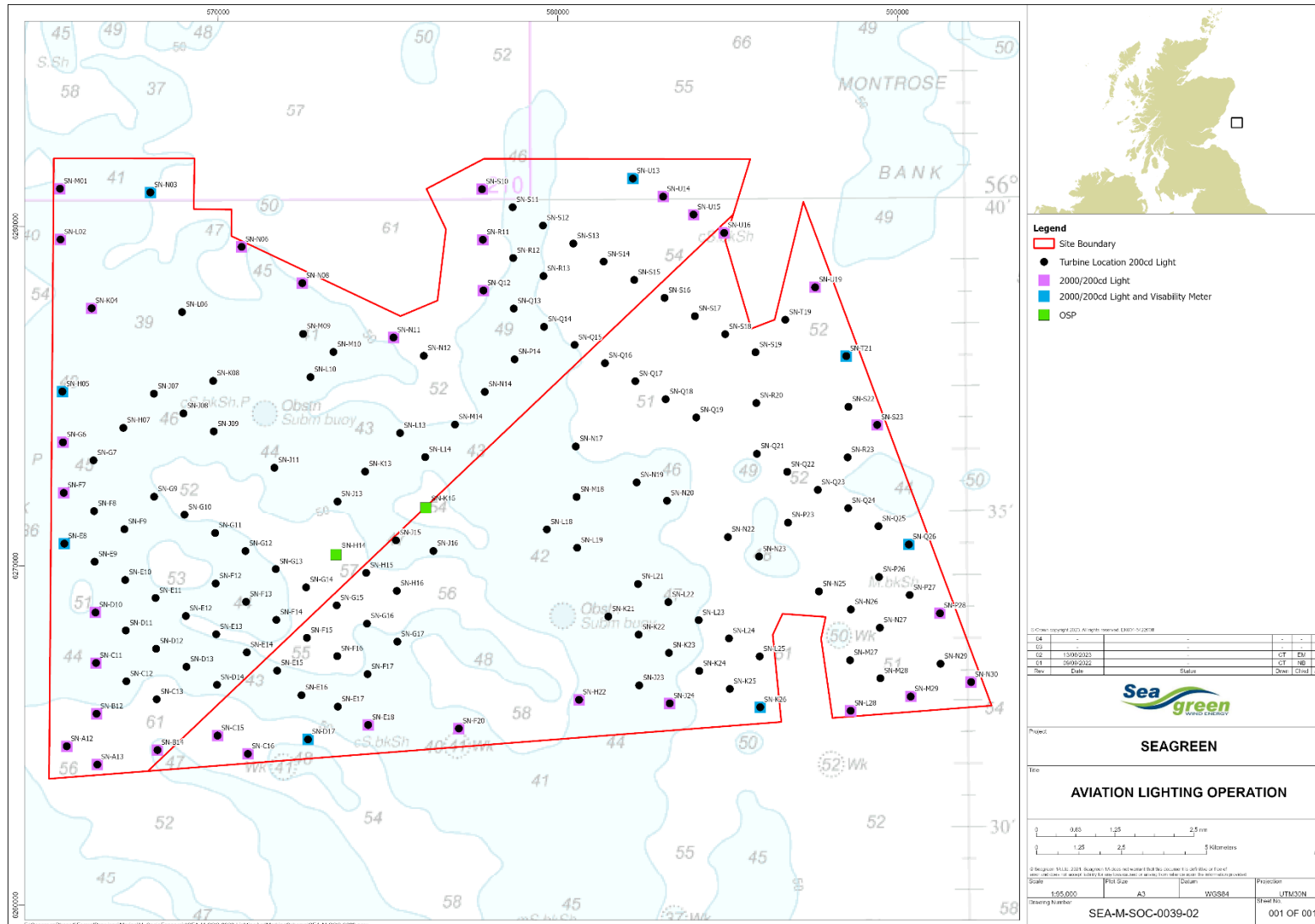


Figure 3.2 Aviation Lighting - Operation

Table 3.1 Operational Aviation Lighting Specifications

Light	Specifications	Structures
2000cd Obstruction Light	<ul style="list-style-type: none"> Red 2000 cd light Flashing Morse 'W' and synchronised Dimmable to 200 cd when visibility greater than 5 km Capable of being switched off at MCA request during SAR operations 360° visibility Compatible with Night Vision Imaging Systems (NVIS) Compliant with CAP 393 (CAA, 2019), CAP 764 (CAA, 2016), and MGN 543 SAR Annex 5 (MCA, 2018). 	SN-A12, SN-A13, SN-B12, SN-B14, SN-C11, SN-C15, SN-C16, SN-D10, SN-D17, SN-E08, SN-E18, SN-F07, SN-F20, SN-G06, SN-H05, SN-H22, SN-J24, SN-K04, SN-K26, SN-L02, SN-L28, SN-M01, SN-M29, SN-N03, SN-N06, SN-N08, SN-N11, SN-N30, SN-P28, SN-Q12, SN-Q26, SN-R11, SN-S10, SN-S23, SN-T21, SN-U13, SN-U14, SN-U15, SN-U16, SN-U19 Visibility meters should be fitted to eight WTGs as follows: SN-D17, SN-E08, SN-H05, SN-K26, SN-N03, SN-Q26, SN-T21, SN-U13
200cd SAR Light	<ul style="list-style-type: none"> Red 200 cd light Steady (when in use) 360° visibility Compatible with NVIS Compliant with MGN 543 SAR Annex 5 (MCA, 2018) / MGN 654 Annex 5 (MCA, 2021). 	All structures (including the OSPs).
Green Heli Hoist Status Light	<ul style="list-style-type: none"> Capable of displaying both flashing and steady light characteristic, and being switched off Compliant with CAP 437 (CAA, 2018) 	All structures (including the OSPs).

Aviation lighting will be controllable from the Marine Coordination Centre (MCC). All lights and WTGs will be under the control of the MCC so that they can be switched on / off via the central control system required during an emergency situation and at the request of the MCA.

Winching areas / heli-decks will be marked as per the requirements of CAP 437.

3.4.2 Blade Marking

Blades will be marked as required under MCA MGN 543 Annex 5 (MCA, 2018)/MGN 654 Annex 5 (MCA, 2021).

Blade hover reference marks will be provided on the WTG blades to provide SAR helicopter pilots with a reference mark when hovering over a WTG nacelle during a rescue. Three marks will be added, one each at the 10, 20 and 30 m 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).

The diameter of the marks will be at least 600 millimetres (mm) but may be larger depending on the overall size of the blade. Each mark will be painted red, to ensure they are clear against the WTG blades.

The blade tip will also be marked with a red band of length corresponding to a distance of approximately 2% of the total blade length. It is noted that the intended lightning protection plans mean that the metal tip and leading edge of the blade are required to be left unpainted. The position and specifications of the red band will therefore be agreed with the MCA once plans are finalised as required under MGN 543 Annex 5 (MCA, 2018)/MGN 654 Annex 3 (MCA, 2021).

An illustration of the indicative blade marking is given in Figure 3.3, noting that the final design of the red band near the tip will be agreed with the MCA.

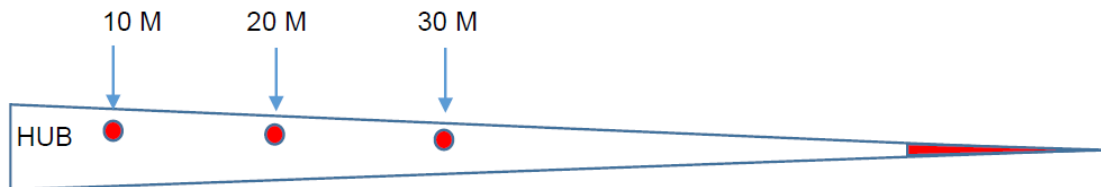


Figure 3.3 – Blade Hover Marks Illustration

3.4.3 ID Marking

Individual Identification (ID) numbers will be marked on all WTG nacelle and OSP roofs so that SAR helicopters and/or other low flying aircraft can locate and/or reference a particular WTG visually. The ID number system is shown in Figure 3.2.

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 m in height and of proportionate width.

3.5 Emergency Reporting

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 maintenance tasks. Furthermore, there may be complex maintenance concerns which are wider ranging and would take longer to diagnose or repair. In cases where an outage is expected to last more than 36 hours, international standards and recommended practices require the issue of NOTAMs, as stated in CAP 764 (CAA, 2016).

The CAA's Safety and Airspace Regulation Group 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 outage be anticipated to be greater than 36 hours in duration, the operator (Seagreen) will request a NOTAM to be issued by informing the NOTAM section of the UK Aeronautical Information Service as soon as possible by telephoning +44 (0) 20 8750 3773/3774 (Aeronautical Information Service will also copy the details of the NOTAM to the operator and to the CAA via email (Windfarms@caa.co.uk)).

The following information will be provided when requesting a NOTAM (for any structure or vessel over 196 feet / 60 m):

- Name of 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/south west quadrant/ entire or 3 nm centred on position 515151N 0010101W));
- Expected date of reinstatement; and
- Contact telephone number.

Upon completion of the remedial works, the Aeronautical Information Service 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.

If an outage is expected to last longer than 14 days then the CAA will also be notified (at Windfarms@caa.co.uk) by the operator (Seagreen) directly to discuss any issues that may arise and longer term strategies.

4. Marine Lighting and Marking

4.1 Introduction

This section sets out how the Seagreen Project will be marked and lit from a marine perspective. The marine lighting and marking scheme has been agreed with the NLB and MCA, and has been designed to be in compliance with the relevant guidance in force at the time the scheme was designed and first approved, which is as follows:

- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendations O-139 (The Marking of Man-Made Offshore Structures, Edition 2) (IALA, 2013) [noting that this has since been superseded by Guideline G1162 (The Marking of Man-Made Offshore Structures, Edition 1) (IALA, 2021)];
- Maritime and Coastguard Agency (MCA), Marine Guidance Notice (MGN) 543, Offshore Renewable Energy Installations (OREIs) - Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response (MCA, 2016) [noting that this has since been superseded by MGN 654 (MCA, 2021) ; and
- UK Standard Marking Schedule for Offshore Installations (DECC (now DESNEZ), 2011).

It is noted that this section provides lighting and marking from a marine perspective for the wind farm as described in Section 1.2. Lighting and marking requirements for any auxiliary Metocean components (e.g., wave buoys) would be agreed in advance of installation with the NLB, including application for Statutory Sanction where applicable (see Section 4.2.1).

4.2 Promulgation of Information

Details of the Seagreen Project will be promulgated to relevant marine stakeholders in advance of, and during, construction, and also during the operational/maintenance phase where appropriate as required under the relevant Marine Licence conditions (see Section 1.3). Stakeholders will also be informed when construction is complete. The relevant marine stakeholders to be informed include but are not limited to:

- United Kingdom Hydrographic Office (UKHO);
- HM Coastguard (via Aberdeen CGOC);
- Northern Lighthouse Board (NLB)
- Local fishing organisations;
- Local marine organisations; and
- Kingfisher Bulletin.

4.2.1 Statutory Sanction

As required by the NLB, Seagreen 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 Seagreen Project that are anticipated to be exhibited for at least six months.

4.3 Construction Phase

4.3.1 Temporary Lighting

During the construction phase, all structures regardless of construction status will be marked with temporary Yellow 2.5 seconds (s) (Fl Y 2.5s) lights (visible through 360°) with a 2 nm range. It is likely that two lights per structure will be used to ensure 360° visibility.

4.3.2 Construction Buoyage

The wind farm will be marked as a construction area during the construction phase via the use of temporary construction buoyage. This will be a combination of cardinal marks and special marks as shown in Figure 4.1. Specifications of each buoy are then given in Table 4.1. At NLB request, four of the cardinal marks will transmit via Automatic Identification System (AIS) as indicated in the figure. Seagreen or an appointed contractor will procure the relevant AIS licences via applications to the Office of Communications as required.

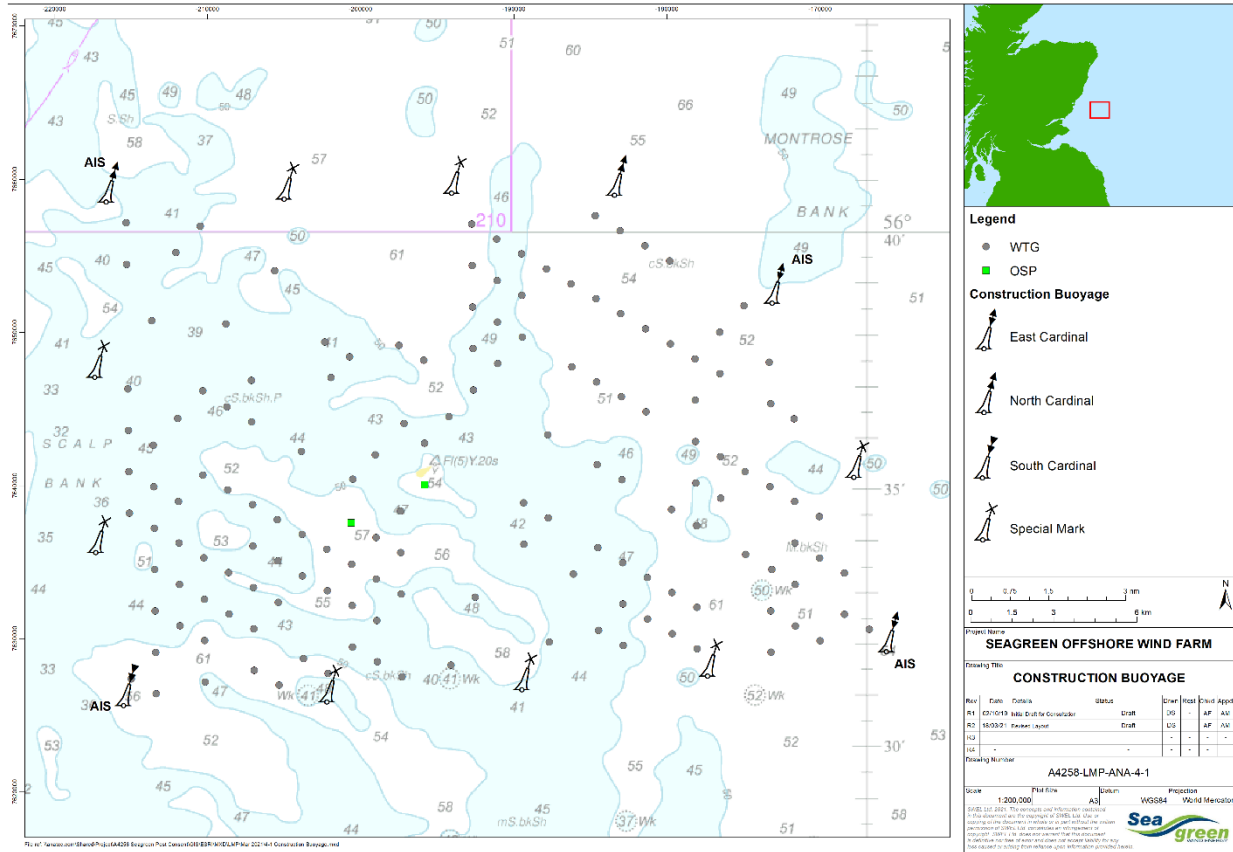


Figure 4.1 Construction Buoyage

Table 4.1 Construction Buoyage Positions and Specifications

Buoy	Locations		AIS	Specifications
	Long	Lat		
North Cardinal	001° 56' 44.74" W	56° 40' 34.68" N	Yes	<ul style="list-style-type: none"> Focal plane of at least 3 m and range of 5 nm; Minimum of 3 m in diameter at waterline; Pillar shaped with a north cardinal shaped top mark, exhibiting a Quick (Q) White (W) light character; Category 1 Availability - 99.8% (IALA 2011); and Radar reflector.
	001° 38' 51.43" W	56° 40' 42.60" N	No	
East Cardinal	001° 33' 18.32" W	56° 38' 36.96" N	Yes	<ul style="list-style-type: none"> Focal plane of at least 3 m and range of 5 nm; Minimum of 3 m in diameter at waterline;

Buoy	Locations		AIS	Specifications
	001° 29' 16.91" W	56° 31' 50.88" N	Yes	<ul style="list-style-type: none"> Pillar shaped with an east cardinal shaped top mark, exhibiting a Very (V) Q (3) 5 s W light character; Category 1 Availability - 99.8% (IALA 2011); and Radar Reflector.
South Cardinal	001° 56' 8.20" W	56° 30' 47.88" N	Yes	<ul style="list-style-type: none"> Focal plane of at least 3 m and range of 5 nm; Minimum of 3 m in diameter at waterline; Pillar shaped with a south cardinal shaped top mark, exhibiting a V Q (6) + L Fl 10s W light character; Category 1 Availability - 99.8% (IALA 2011); and Radar Reflector.
Special Mark	001° 50' 31.02" W	56° 40' 37.92" N	No	<ul style="list-style-type: none"> Focal plane of at least 3 m and range of 5 nm; Minimum of 3 m in diameter at waterline; Pillar shaped with a yellow 'x' shaped top mark, exhibiting a Fl Y 5s light character; Category 2 Availability - 99.0% (IALA 2011); and Radar Reflector.
	001° 44' 37.32" W	56° 40' 44.76" N	No	
	001° 30' 28.37" W	56° 35' 13.92" N	No	
	001° 35' 37.07" W	56° 31' 22.44" N	No	
	001° 42' 9.04" W	56° 31' 06.40" N	No	
	001° 49' 1.02" W	56° 30' 52.20" N	No	
	001° 57' 8.93" W	56° 33' 46.44" N	No	
	001° 57' 10.94" W	56° 37' 10.56" N	No	

4.3.3 Construction Vessels

All vessels associated with the construction of the Seagreen Project will be marked and lit as per the International Convention of the Prevention of Collisions at Sea (COLREGs) (International Maritime Organization ((IMO), 1972) and (where applicable e.g., jack up vessels) the UK Standard Marking Schedule for Offshore Installations (DECC, 2011).

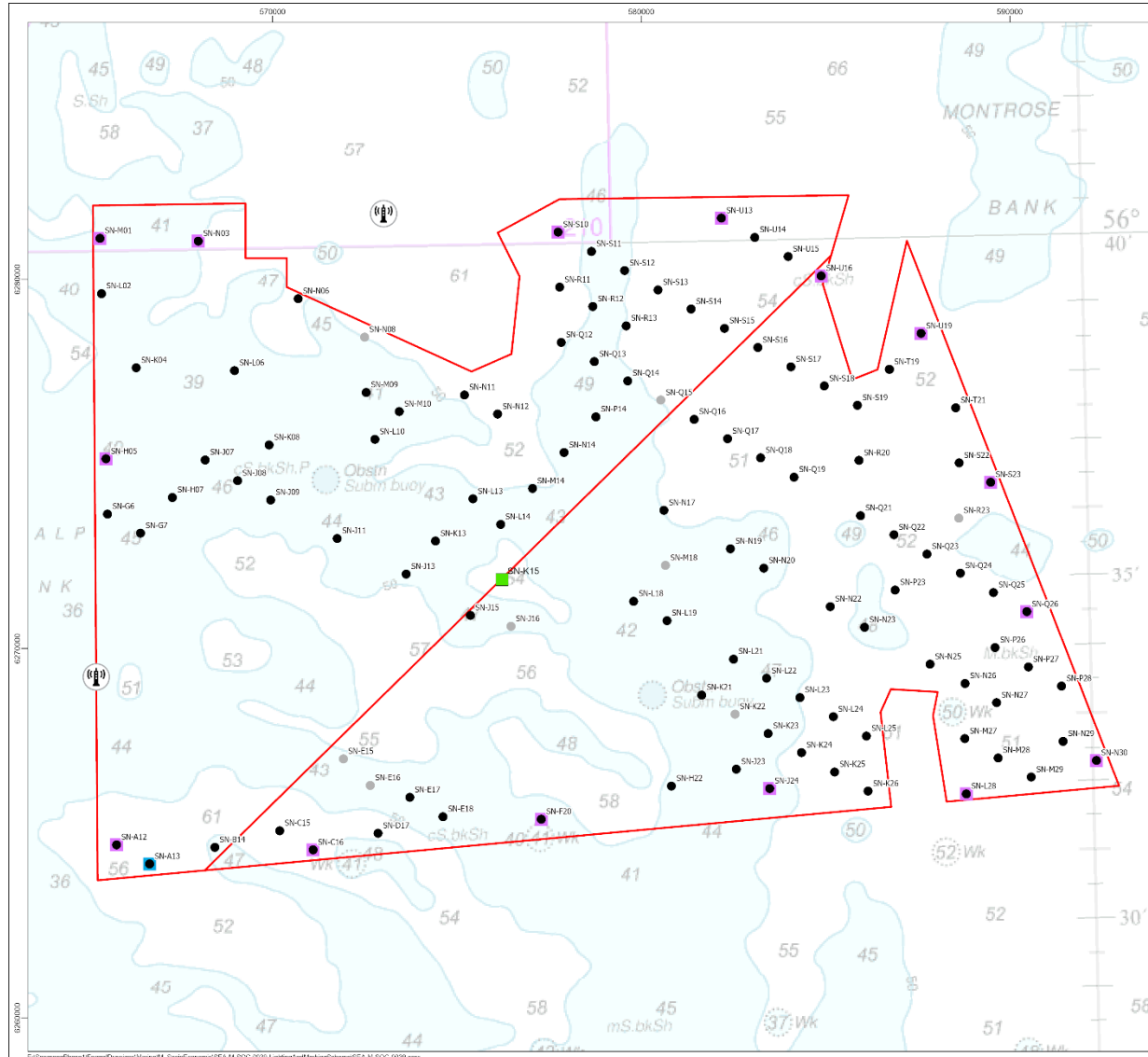
4.3.4 Interim Construction Stage

There will be a time gap in between the installation of the WTGs on suction bucket foundations (Stage 1) and the WTGs in Stage 2. During this time period, certain Stage 1 WTGs will be commissioned and begin generating. It is intended that the operational lighting and marking of the Stage 1 WTGs will become active at this stage, and the majority of construction buoyage removed, with special marks left in place in the positions given in Table 4.2 (and shown in Figure 4.2) until the Stage 2 WTGs are installed and commissioned, and NLB are satisfied that the operational lighting and marking of the entire site is as required.

The final approach will be discussed and agreed with NLB prior to any changes to the implemented construction phase lighting and marking (inclusive of temporary lighting and construction buoyage). In particular, should Seagreen seek to remove any construction buoys prior to final commissioning of the operational lighting and marking, statutory sanction would be sought with NLB as required.

Table 4.2 Interim Construction Stage Buoyage

Buoy	Locations		Specifications
	Long	Lat	
Special Mark	001° 48' 30.64" W	56° 40' 27.89" N	<ul style="list-style-type: none"> Focal plane of at least 3 m and range of 5 nm; Minimum of 3 m in diameter at waterline; Pillar shaped with a yellow 'x' shaped top mark, exhibiting a Fl Y 5s light character; Category 2 Availability - 99.0% (IALA 2011); and Radar Reflector.
	001° 56' 19.94" W	56° 33' 46.44" N	



Legend

- Site Boundary
- Seagreen Layout (114)
 - Turbine Location Confirmed (106)
 - Turbine Location Confirmed (Utilised Spare) (8)
- OSP
- Marine Lighting And Marking
 - SPS and Sound Signal
 - SPS
 - Special Mark

Rev	Date	By	Check	App'd
01	2014/03/03			
02	2014/03/03			
03	2014/03/03			
04	2014/03/03			

Project: **SEAGREEN**

Title: **MARINE LIGHTING AND MARKING - INTERIM SCENARIO**

Scale: 1:100,000

Drawing Number: **SEA-M-SOC-0039-03**

Sheet: **001 OF 001**

Figure 4.2 Marine Lighting and Marking – Interim Construction Scenario

4.4 Operational Phase

4.4.1 Lighting and Sound Signals

In line with IALA O-139/G1162, certain key periphery structures have been marked as SPS (Significant Peripheral Structures), as is shown in Figure 4.3. Specifications of the SPS lights are then detailed in Table 4.3. Sound signals will be fitted to the majority of SPS, however where two SPS are adjacent, only one will be fitted with a sound signal.

It is noted that IALA O-139/G1162 also requires the use of lights of a lower range than those for the SPS installed on certain Intermediate Periphery Structures (IPS). However, NLB have indicated they are seeking to phase out the use of IPS. On this basis, no IPS are proposed for the Seagreen Project.

Operational buoyage is included in Figure 4.3 and is discussed further in Section 4.4.2.

Note that the interim lighting scenario has been revised to reflect an amended array layout necessitated by the use of spare WTG locations during Stage 1 construction. This was subject to consultation with MCA and NLB. It is noted that the lighting and marking scheme does not account for the potential use of spare locations in Stage 2. In the event that a spare location is used, consultation would be undertaken with the NLB to confirm whether any changes to the scheme are necessary. This approach has been agreed with the NLB and MCA and was successfully implemented for the use of spare locations in Stage 1 (see Figure 4.2).

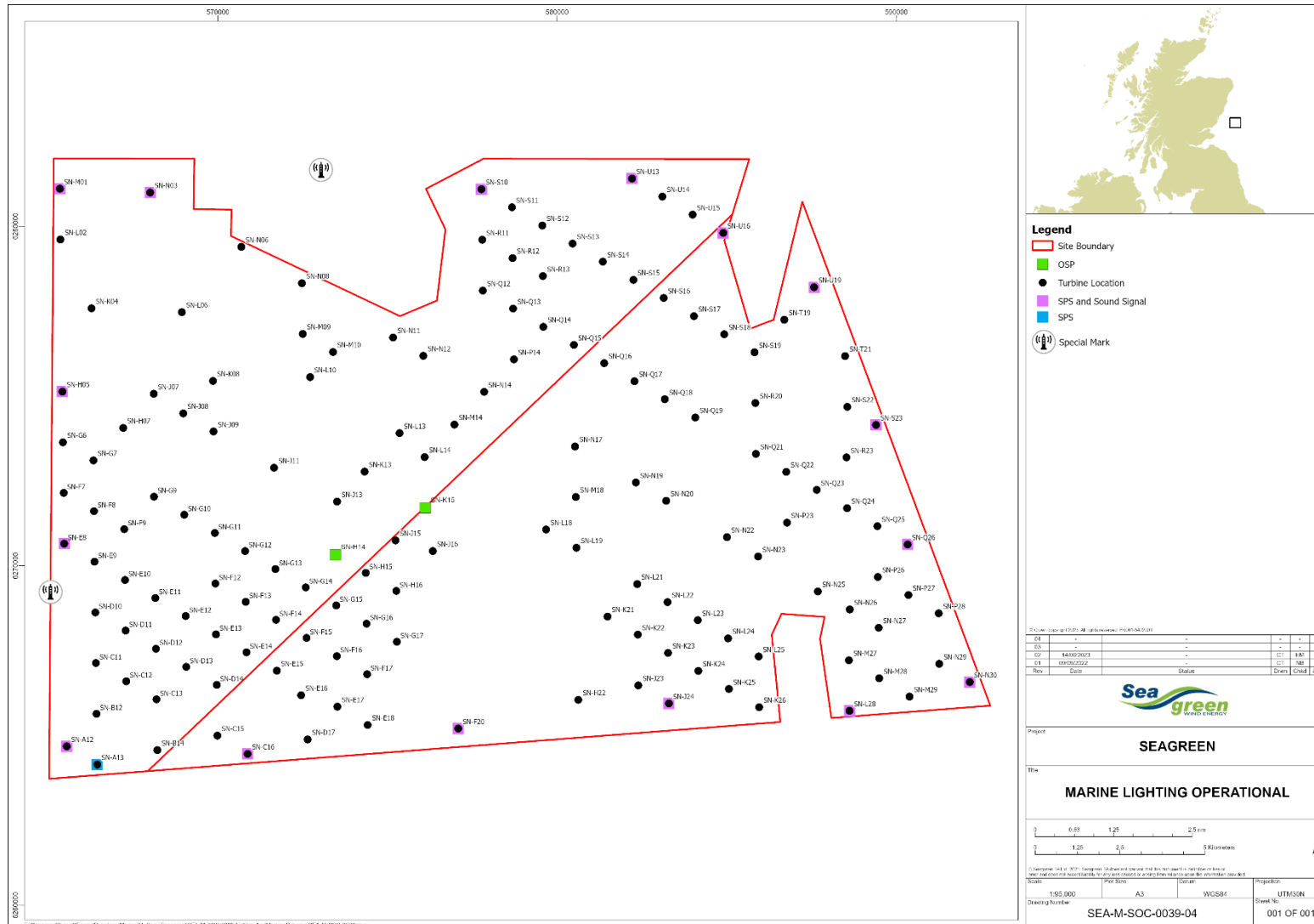


Figure 4.3 Marine Lighting – Operation

Table 4.3 Marine Lighting Specifications

Structure	Specifications	Structure IDs
SPS	<ul style="list-style-type: none"> • Located on a corner or other significant point • FL. Y. 5 s • 5 nm nominal range • 360° visibility (multiple lights per structure may be used to achieve this) • IALA Category 1 availability (> 99.8%) • All SPS lights shall be synchronised • Lights shall be located not less than 6 m and not more than 30 m above Highest Astronomical Tide (HAT) 	SN-A12, SN-A13, SN-C16, SN-E08, SN-F20, SN-H05, SN-J24, SN-L28, SN-M01, SN-N03, SN-N30, SN-Q26, SN-S10, SN-S23, SN-U13, SN-U16, SN-U19
Sound Signal	<ul style="list-style-type: none"> • Have character Morse 'U' 30 s with minimum duration of each blast of 0.75 s • At least 2 nm range • 360° audibility • At least IALA Category 3 (> 97.0% availability) • Fitted not lower than 6 m above HAT, and not higher than 30 m above HAT • Each sound signal should have its own visibility sensor – signal to activate when visibility less than 2 nm. 	SN-A12, SN-C16, SN-E08, SN-F20, SN-H05, SN-J24, SN-L28, SN-M01, SN-N03, SN-N30, SN-Q26, SN-S10, SN-S23, SN-U13, SN-U16, SN-U19

As required by the MCA, all marine lights and sound signals will be remotely operable via the central control system. In particular, they will be able to be switched off remotely if requested by the MCA during SAR operations.

4.4.2 Buoyage

Following consultation with the NLB, an operational buoy will be positioned on the northern periphery of the site. As per Figure 4.3, this buoy is intended to provide an interim mark in between the SPS lights fitted to WTGs SN-N03 and SN-S10. Specifications of the buoy are given in Table 4.4. It will display a special mark characteristic and will not transmit via AIS.

Table 4.4 Operational Buoyage Positions and Specifications

Buoy	Locations		Specification
	Long	Lat	
Special Mark	001° 48' 30.64" W	56° 40' 27.89" N	<ul style="list-style-type: none"> • Focal plane of at least 3 m and range of 5 nm; • Minimum of 3 m in diameter at waterline; • Pillar shaped with a yellow 'x' shaped top mark, exhibiting a Fl Y 5 s light character; • Category 2 Availability - 99.0% (IALA 2011); and • Radar Reflector.

4.4.3 Automatic Identification System (AIS)

To provide additional mitigation to passing traffic, Seagreen will utilise AIS AtoNs to mark the operational site. The final positions of these AtoNs will be agreed with NLB prior to procurement of the relevant AIS licences, noting that the use of virtual / synthetic AIS has been agreed with NLB, and as such there is flexibility around the AtoN positions. Indicatively, based on NLB consultation, four AIS AtoNs will be implemented marking the corner extremes of the site.

The AIS transmitters will be required to have an availability of not less than 97.0% (IALA Category 3). Seagreen or an appointed contractor will procure the relevant AIS licences via applications to the Office of Communications as required.

4.4.4 ID Marking

Each wind farm structure will display ID panels with black letters / numbers on a yellow background visible in all directions. The ID characters will be illuminated (either by a low-intensity light or via retro reflective material visible from a vessel) thus enabling the structure to be detected at a suitable distance. For offshore wind farms, the size of the ID 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 3 m above sea level, and at a distance of not less than 150 m from the structure. This lighting will be hooded or baffled to avoid confusion with the navigational lighting and marking.

The ID number system is shown in Figure 4.3.

4.4.5 WTG Paint

Foundations will be painted yellow (RAL 1023, Traffic Yellow) from HAT up to the interface point. It is anticipated that this will be between 20 and 30m above LAT for the foundation types that will be used. Above this height structures will be painted grey (RAL 7035, Light Grey).

4.4.6 OSP Marking

The sides of the OSPs will be marked with clear and visible unique identification characters visible from marine vessels. As per Figure 3.2 and Figure 4.3, OSPs will be marked with ID numbers SN-H14 and SN-K15.

The foundations of the OSPs will be painted yellow (RAL 1023).

4.4.7 Export Cable Marker Board

Following consultation with the NLB it has been agreed with Marine Scotland that an export cable marker board is not necessary to mark the export cable landfall point in the case of the Seagreen project.

4.5 Emergency Reporting

A requirement of the management of marine aids to navigation within UK waters is to report failures to NLB. This is achieved through the AtoN availability reporting database¹. The system is administered by NLB in order to assist wind farm operators in fulfilling their responsibility to maintain records of aid to navigation 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.

Seagreen will have overall responsibility to provide records of AtoNs and details of failure or losses to NLB. The NSP provides specific details on other reporting requirements and notifications to local mariners.

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 aid to navigation is repaired or replaced. Any such mitigation would be agreed with the NLB and MCA in advance of implementation.

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

5. Compliance with the Environmental Statement (ES)

The relevant conditions of the S36 Consent and Marine Licences require that the Seagreen Project be constructed in accordance with the Application. Sections 5.1 and 5.2 set out information from the ES, and original application with regard to:

- Compliance with the parameters assessed in the ES; and
- Lighting and marking related mitigation and management.

5.1 Compliance with Parameters Assessed in the ES

The ES for the Seagreen project described the range of methods that could be applied during the construction of the Development. This was presented as a 'Rochdale Envelope' incorporating a variety of options in relation to the development design and the approach to installation.

Since award of development consent for Seagreen, the design of the project and the approach to installation has been substantially refined, as set out within this LMP and in other relevant consent plans. To demonstrate compliance with those methods assessed within the ES and original Application, Appendix C provides a tabulated comparison of project construction parameters and methodologies as presented in the ES with this LMP.

5.2 Delivery of Construction-related Mitigation Proposed in the ES

The ES for the Seagreen project detailed a number of mitigation commitments specific to construction and installation activities. Appendix D presents the commitments made by Seagreen in the ES to mitigation measures relative to construction methods and processes set out in this LMP. The table provides details of the commitments and a cross-reference to where each commitment is implemented.

A complete register of the mitigation, management and monitoring commitments made in the ES required by consent conditions is set out in the commitments registers, included as part of the Project CEMP.

7. References

Table 7.1 provides a list of Consent Plans that are relevant to this Lighting and Marking Plan (LF000009-CST-OF-PLN-0010). It is followed by a list of other reference documents.

Table 7.1 Relevant Consent Plans

SWEL Document Number	Title
LF000009-CST-OF-PLN-0007	Offshore Navigational Safety Plan
LF000009-CST-OF-MST-0001	Offshore Wind Farm Construction Method Statement
LF000009-CST-OF-PRG-0001	Offshore Wind Farm Operations and Maintenance Programme
LF000009-CST-OF-PLN-0006	Offshore Vessel Management Plan

Anatec (2012). *Seagreen Offshore Wind Farm - Navigation Risk Assessment*. Aberdeen: Anatec.

DECC (2011). *Standard Marking Schedule for Offshore Installations*. London: DECC (now DESNEZ).

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

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

CAA (2019). *CAP 393 - Air Navigation: The Order and Regulations Article 222*. London: CAA.

IALA (2013). *International Association of Marine Aids to Navigation and Lighthouse Authorities Recommendations O-139: The Marking of Man-Made Offshore Structures, Edition 2*. Saint Germain en Laye, France: IALA (superseded by G1162).

IALA (2021). *International Association of Marine Aids to Navigation and Lighthouse Authorities Guideline G1162: The Marking of Man-Made Offshore Structures, Edition 1*. Saint Germain en Laye, France: IALA.

IALA (2017). *R1001 - The IALA Maritime Buoyage System Edition 1.0*. Saint Germain en Laye, France: IALA.

IMO (1972). *International Regulations for Preventing Collisions at Sea*. London: IMO.

MCA (2016). *Marine Guidance Note MGN 543 – Offshore Renewable Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response*. Southampton: MCA (superseded by MGN 654).

MCA (2021). *Marine Guidance Note MGN 654 – Offshore Renewable Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response*. Southampton: MCA.

MCA (2018). *OREI: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response. Annex 5 of MGN 543 (Version 2)*. Southampton: MCA (superseded by Annex 5 of MGN 654).

MCA (2021). *Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response. Annex 5 of MGN 654 (Version 3)*. Southampton: MCA.

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

Appendix A – LMP List of Abbreviations and Definitions

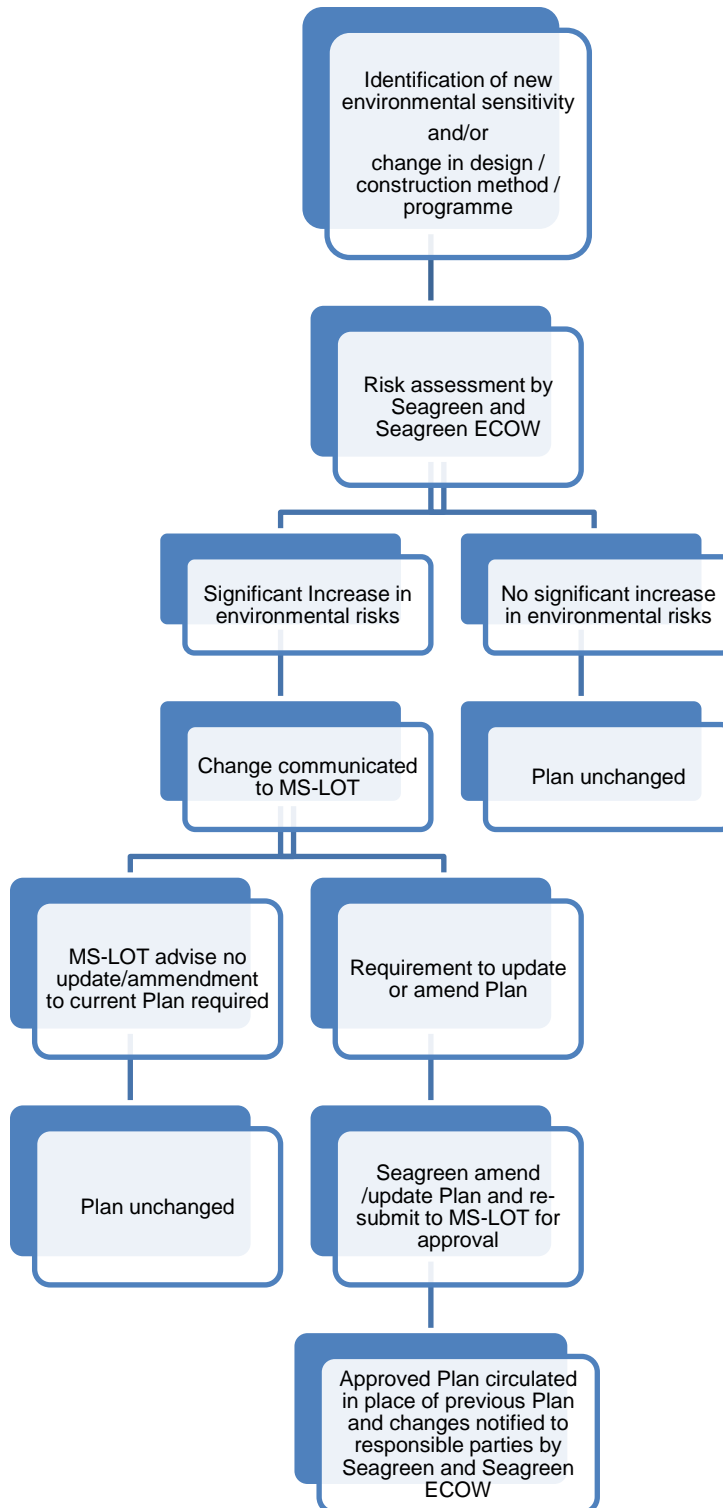
Term	Description
Alpha Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of Seagreen Alpha Wind Farm on 10 October 2014 as amended by the revised marine licence granted by the Scottish Ministers on 28 August 2018 (reference 04676/18/0) and as further amended by the revised marine licence granted by the Scottish Ministers on 12 December 2019 (reference 04676/19/0)
Bravo Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of Seagreen Bravo Wind Farm on 10 October 2014 as amended by the revised marine licence granted by the Scottish Ministers on 28 August 2018 (reference 04677/18/0) and as further amended by the revised and transferred marine licence granted by the Scottish Ministers on 12 December 2019 (reference 04677/19/0)
(the) consents	Collective term used to describe the Section 36 consents and Marine Licences issued to SAWEL, SBWEL and Seagreen
°	Degrees
AIP	Aeronautical Information Publication
AIS	Automatic Identification System
ANO	Air Navigation Order
AtoN	Aids to Navigation
CAA	Civil Aviation Authority
Cd	Candela
CEMP	Construction Environmental Management Plan
CGOC	Coastguard Operation Centre
CMB	Cable Marker Boards
COLREGs	International Convention for the Prevention of Collisions at Sea
commitments register	A register that sets out all commitments to manage and mitigate potential environmental impacts made by Seagreen
Contractor	A contractor as appointed by SWEL
DECC	Department for Energy and Climate Change (now Department for Energy Security and Net Zero)
DGC	Defence Geographic Centre
DSLIP	Development Specification and Layout Plan
ECoW	Ecological Clerk of Works as required under Alpha and Bravo Section 36 Condition 29 and the Marine Licence Condition 3.2.2.12.
ERCoP	Emergency Response Cooperation Plan

Term	Description
ES	Environmental Statement
FI	Flashing
HAT	Highest Astronomical Tide
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ID	Identification
IMO	International Maritime Organisation
IPS	Intermediate Periphery Structures
JNCC	Joint Nature Conservation Committee
km	Kilometres
Landfall	The point above MHWS where the OTA export cables connects to the OnTW
LAT	Lowest Astronomical Tide
Licensing Authority	Marine Scotland acting on behalf of the Scottish Ministers
Licensee	Seagreen Wind Energy Ltd (Seagreen), a company with number 06873902 and having its registered office at No1 Forbury Place, 43 Forbury Road, Reading, United Kingdom RG1 3JH, on behalf of SAWEL in respect of the OWF and on behalf of SAWEL and SBWEL in respect of the OTA.
LMP	Lighting and Marking Plan, required under Condition 19 of the S36 Consent and Condition 3.2.2.14 of the Marine Licence
m	Metre
Marine Coordination	The management and surveillance of people, vessels and Offshore structures to ensure the safe preparation and execution of Offshore activities, in order to minimise the probability of an incident, and to provide effective response if an incident does occur
Marine Licence	The three marine licences for the Seagreen Project, comprising the Alpha Marine Licence, the Bravo Marine Licence and the OTA Licence
MCA	Maritime and Coastguard Agency
MCC	Marine Coordination Centre
MGN	Marine Guidance Notice
MHWS	Mean High Water Springs
mm	Millimetres
MMLMP	Meteorological Mast(s) Lighting and Marking Plan
MOD	Ministry of Defence
MS-LOT	Marine Scotland Licensing and Operations Team

Term	Description
MW	Megawatt
NLB	Northern Lighthouse Board
nm	Nautical Mile(s)
NOTAM	Notice to Airmen
NSP	Navigational Safety Plan
NtM	Notice to Mariners
NVIS	Night Vision Imaging System
OnTW	Onshore Transmission Works, from landfall consisting of onshore buried export cables and new transmission substation
OTA	Offshore Transmission Asset, comprising the OSPs and the transmission cable required to connect the Wind Farm Assets to the OnTW from the OSPs to the MHWS at the landfall at Carnoustie
OMP	Operation and Maintenance Programme, required under S36 condition 16 and Marine Licence condition 3.2.3.2
OREI	Offshore Renewable Energy Installation
OTA Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of the OTA on 10 October 2014 as amended by the revised marine licence granted by the Scottish Ministers on 6 March 2019 (reference 04678/19/0)
OSP	Offshore Substation Platform means an alternating current Offshore substation platform which is a standalone modular unit that utilises the same substructure and foundation design as a wind turbine generator
OWF	The Wind Farm Assets
Q	Quick
s	Second
S36 Consents	Consent under section 36 of the Electricity Act 1989 granted by the Scottish Ministers on 10 October 2014 in respect of the Seagreen Alpha and Seagreen Bravo offshore wind farms, both as varied by the Scottish Ministers by decision letter issued pursuant to an application under section 36C of the Electricity Act 1989 on 28 August 2018 and, in respect of the Seagreen Bravo S36 Consent, as assigned, with the consent of the Scottish Ministers from SBWEL to SAWEL by assignation dated 22 November 2019 and intimated to the Scottish Ministers by intimation dated 27 November 2019.

Term	Description
SAR	Search and Rescue
SAWEL	Seagreen Alpha Wind Energy Limited, a company with registered number 07185533 and having its registered office at No1 Forbury Place, 43 Forbury Road, Reading, United Kingdom RG1 3JH
SBWEL	Seagreen Bravo Wind Energy Limited, a company with registered number 07185543 and having its registered office at No1 Forbury Place, 43 Forbury Road, Reading, United Kingdom RG1 3JH
Seagreen (SWEL)	Seagreen Wind Energy Limited (SWEL), the parent company of Seagreen Alpha Wind Energy Ltd (SAWEL) and Seagreen Bravo Wind Energy Ltd (SBWEL), (company number 06873902) and having its registered office at No.1 Forbury Place, 43 Forbury Road, Reading, United Kingdom, RG1 3JH
Site	The area outlined in red in Figure 1 attached to the S36 consent Annex 1 and the area outlined in red and the area outlined in black in the figure contained in Part 4 of the OTA Marine Licence*
SNH	Scottish Natural Heritage
SPS	Significant Peripheral Structure
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
V	Very
VMP	Vessel Management Plan, required under Condition 15 of the S36 consent and Condition 3.2.2.8 of the Marine Licence
W	White
WTG	Wind Turbine Generator
Y	Yellow

Appendix B – Change Management Procedure



Appendix C – Compliance with ES parameters and Processes

Table C.1 details project parameters and construction and operational processes as given in the ES and compares against the relevant contents of this LMP.

Table C.1 Summary of ES Parameters and Processes relevant to this LMP

Parameter/Process	ES	LMP
Key Parameters		
Number of WTGs	Up to 150	150
Number of Auxiliary Platforms	Up to five ²	Two OSPs
Number of Met Masts	Up to six	None
Rotor Diameter	Max 167 m	164m
Minimum WTG Spacing	(5x rotor diameter) (610m – 835m))	1002m (excluding micro-siting)
Blade Clearance	Minimum 26.1 m above LAT	37m-41m
Construction and Operational Processes		
Temporary Lighting on structures during construction	May be used.	As per Section 4.3.1, all structures will be marked with temporary lighting during the construction phase.
Marking of site as a buoyed construction area during the construction phase	In line with IALA Maritime Buoyage System (IALA, 2017) and in consultation with NLB.	Buoyage will be used which are compliant with IALA requirements, as per Section 4.3.2.
Construction Vessels Marking	As per COLREGS (IMO, 1972)	As per COLREGS (IMO, 1972), see Section 4.3.3.

² Number modelled within the NRA (Anatec, 2012)

Parameter/Process	ES	LMP
ID Marking	All WTGs and substations marked with a unique ID number: <ul style="list-style-type: none"> • Clearly visible from sea and air; • Illuminated during hours of darkness; and • Hooded or baffled to avoid confusion with navigation marks. 	As per Sections 3.4.3 (aviation) and 4.4.4 (marine), all structures will display ID markings.
Lighting of select periphery structures during operation	Key periphery structures marked as SPS or IPS.	See Section 4.4.1 for marine lighting that will be implemented during the operational phase.
Sound signals	Use of sound signals that operate automatically when visibility is less than 2 nm.	See Section 4.4.1 for details of sound signals.

Appendix D – Summary of mitigation commitments

Table D.1 details the mitigations associated with lighting and marking included within the ES, and summarises how these have been accounted for within this LMP.

Table D.1 Summary of ES Mitigation Commitments relevant to this LMP

Source	Reference (ES Chapter and paragraph)	Details of commitment	Implementation
ES	Chapter 5: Project Description (para 5.43)	The rotor, nacelle and upper tower section will be painted the semi -matt pale grey colour RAL 7035. The lower tower section of each WTG, from 15m above Highest Astronomical Tide (HAT) to the level of HAT, will be painted the high visibility yellow colour RAL 1004.	See Section 4.4.5. Note that in line with current standard industry practise, RAL 1023 will be used for the yellow paint.
	Chapter 5: Project Description (para 5.68)	Wave buoys will be protected by guard buoys.	Lighting and marking of wave buoys will be agreed with the NLB as per Section 4.1.
	Chapter 5: Project Description (para 5.69)	Consult with NLB regarding lighting of wave buoys. Each [wave] Buoy will be marked with a flashing amber light to standard requirements and an additional radar reflector fitted to enhance radar visibility	Lighting and marking of wave buoys will be agreed with the NLB as per Section 4.1.
	Chapter 5: Project Description (para 5.205)	All lighting of WTGs and offshore structures will comply with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) requirement O-139 (marine lighting requirements), Civil Aviation Publication (CAP) 393 and 794 for aviation lighting requirements.	See Section 4.1.
	Chapter 5: Project Description (para 5.206)	WTGs and OSPs will have Unique Identification Characters, including a numerical identification clearly visible from a vessel and from the air. Will be illuminated during the hours of darkness, if required. This lighting will be hooded or baffled to avoid confusion with navigation marks.	See Sections 3.4.3 (aviation) and 4.4.4 (marine).

Source	Reference (ES Chapter and paragraph)	Details of commitment	Implementation
	Chapter 5: Project Description (para 5.207)	The separation between SPS should not exceed 3nm and the separation to IPSs should not exceed 2nm.	Distances between SPS have been agreed with the NLB, as per Section 4.4.1. It is noted that in agreement with NLB, distances between certain SPS exceed 3nm. In line with NLB requirements and current industry standards, no WTGs have been designated as IPS.
	Chapter 5: Project Description (para 5.208)	Each structure will be provided with fog horns that will operate automatically when the meteorological visibility is 2 nm or less.	In agreement with NLB and in line with current industry practice, only certain peripheral structures will be fitted with sound signals, see Section 4.4.1.
	Chapter 5: Project Description (para 5.209)	For any semi-permanent structures, markings will also comply with the NLB marine navigation requirements, most likely IALA O-139.	See Section 4.1.
	Chapter 15: Shipping and Navigation (para 15.277)	Promulgation of information and warnings through Notices to Mariners, Kingfisher publications, fisheries liaison, local recreation clubs and marinas and further appropriate media on construction activities, cable installation works and OWF matters.	See Sections 3.2 (aviation) and Section 4.2 (marine).
		Use of vessels that are 'fit for purpose' for the construction activities including marked in accordance with COLREGS and fitted with AIS transponders to prevent them becoming a risk factor.	See Section 4.3.3.
		Aids to Navigation in line with IALA O-139 and MCA/NLB requirements (which will include a system routine inspection of maintenance and lights and markings).	See Section 4.1. Emergency reporting of faults is detailed in Sections 3.5 (aviation) and 4.5 (marine).
		Additional buoyage if required to assist safe navigation (based on guidance from NLB).	See Sections 4.3.2 (construction) and 4.4.2 (operation).

Source	Reference (ES Chapter and paragraph)	Details of commitment	Implementation
	<p>Chapter 15: Shipping and Navigation – Appendix J1: Navigational Risk Assessment (NRA) (Section 22.1, Table 22.1)</p>	<p>Marked on Admiralty Charts</p> <p>The wind farms will be charted by the UKHO using the magenta WTG tower chart symbol found in publication ‘NP 5011 - Symbols and Abbreviations used in Admiralty Charts’.</p> <p>Submarine cables associated with wind farms will also be charted on the appropriate scale charts.</p> <p>Information Circulation</p> <p>Appropriate liaison to ensure information on the wind farm sites and special activities is circulated in NtM, Navigation Information Broadcasts and other appropriate media</p> <p>Marking and Lighting</p> <p>Structures to be marked and lit in line with NLB and IALA guidance.</p> <p>Compliance with MCA Marine Guidance Note (MGN) 371 including Annex 5</p> <p>Annex 5 specifies ‘Standards and procedures for generator shutdown and other operational requirements in the event of a search and rescue, counter pollution or salvage incident in or around an OREI.’</p>	<p>See Section 4.2</p> <p>See Sections 3.2 (aviation) and Section 4.2 (marine)</p> <p>See Section 4.1.</p> <p>As per Section 4.1, this LMP complies with the MCA guidance in force at the time the LMP was prepared and first approved, namely MGN 543 (and its annexes), which superseded MGN 371 in 2016. Seagreen will seek to comply with updated guidance including MGN 654, which has replaced MGN 543</p>
	<p>Chapter 18: Military and Civil Aviation (Mitigations following paras 18.75 and 18.98)</p>	<p>Project Alpha / Bravo will operate according to Article 220 of the UK ANO 2009 and will be lit in accordance with CAA and MOD requirements.</p>	<p>As per Section 3.1, the relevant guidance has been complied with. Note that the referenced Article 220 of the UK ANO 2009 is now Article 223 in the updated UK ANO 2016.</p>
	<p>Chapter 18: Military and Civil Aviation (Mitigations following</p>	<p>When developed the Project Alpha/Bravo sites will be clearly defined on all aviation charts in accordance with MOD and CAA</p>	<p>As per Section 3.2, Seagreen will promulgate the relevant information to ensure the</p>

Source	Reference (ES Chapter and paragraph)	Details of commitment	Implementation
	paras 18.71 and 18.95)	requirements.	structures associated with the Seagreen Project are displayed on aviation charts.
	Chapter 18: Military and Civil Aviation (18.73, 19.98) and Mitigation and Monitoring (22-7, 22.38)	WTGs to be fitted with medium intensity (minimum 2,000 candela) steady red lighting on the top of the nacelle such that the light or lights are visible from all directions and that such lighting is displayed at night. With the permission of the CAA only those WTGs on the perimeter of a wind farm will be fitted with such lighting.	As per Section 3.4.1, all periphery WTGs will be lit via 2000cd red aviation lights. In line with standard industry practise and in agreement with CAA, NLB, and MCA, these lights will flash Morse W.