

<b>Project Title</b>	Seagreen Wind Energy Ltd
<b>Document Reference Number</b>	LF000009-CST-OF-PRG-0001

# Operations and Maintenance Programme (Wind Farm Assets)

Section 36 Consent, Condition 16  
For approval of the Scottish Ministers

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### **Purpose of the Programme**

This Operations and Maintenance Programme (Wind Farm Assets) (OWF OMP) is submitted to address the specific requirements of the relevant conditions attached to 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 an application under section 36C of the Electricity Act 1989 on 28 August 2018 and, in respect of the consent applicable to the Bravo Offshore Wind Farm, as assigned to SAWEL on 22 November 2019.

Seagreen Alpha and Seagreen Bravo OWFs and the Offshore Transmission Asset (OTA) are collectively referred to as the 'Seagreen Project'.

The overall aims and objectives of the OWF OMP are to set out the procedures and good working practices for the operation and maintenance (O&M) of the Seagreen OWF infrastructure. A separate OMP (LF000009-CST-OF-PRG-0004) has been prepared for the O&M of the Seagreen OTA infrastructure.

The OWF OMP demonstrates that operations and maintenance procedures to be employed align with those set out within the Environmental Statement (ES) and ES Addendum.

## Operations and Maintenance Programme Overview

### Structure of the Plan

The OWF OMP is structured as follows:

Section 1	Provides an overview of the consent requirements that underpin the content of this OWF OMP, identifies linkages with other consent plans and describes the process for making updates and amendments to the programme
Section 2	Provides an overview of the OWF assets
Section 3	Describes the approach to safety, health and environmental management and the Environmental Management System (EMS)
Section 4	Describes and provides indicative timings for routine servicing and maintenance activities, and sets out potential unscheduled activities that are anticipated during the operational lifecycle of the assets
Section 5	Describes relevant environmental sensitivities to be considered when planning the O&M activities, and good working practices to be adopted
Section 6	Demonstrates compliance with the original application
Section 7	Lists applicable reference documents used to inform this OWF OMP
Appendix A	Lists the abbreviations and defines terms used in the OWF OMP
Appendix B	Sets out the OWF OMP Change Management Procedure
Appendix C	Lists good practice guidance applicable to offshore wind operations and maintenance

### Scope of the Plan

This OWF OMP covers, in line with the requirements of the consent conditions, the following in relation to the Seagreen OWF assets:

- The management systems to be implemented during the O&M of the wind farm asset;
- A description of the activities to be undertaken during the O&M phase
- The good working practices to be adopted for O&M of the WTGs, substructures and inter-array cable network; and
- The environmental sensitivities which may affect the timing of the O&M activities

### **Plan Audience**

This OWF OMP will be submitted for approval to the Scottish Ministers in consultation with other stakeholders, in relation to monitoring compliance with the specific requirements of the relevant consent conditions.

Compliance with this OWF OMP will be monitored by Seagreen's Site Operations Manager and Environmental Advisor, Seagreen's appointed Contractors and the Marine Scotland Licensing and Operations Team (MS-LOT).

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

- Seagreen's head office;
- Seagreen's construction office and Marine Coordination Centre;
- at the premises of any Contractor acting on behalf of Seagreen in relation to O&M activities; and
- aboard any vessel engaged in the O&M of the wind farm asset.

## 1. Introduction

### 1.1 Consents and Licences

Seagreen Wind Energy Ltd (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).

Marine Licences for Seagreen Alpha OWF, Seagreen Bravo OWF and the Offshore Transmission Asset (OTA) were also awarded by Scottish Ministers in October 2014 (subsequently varied) under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009. In addition, a Marine Licence was granted in 2019 (and subsequently varied in 2020) providing an alternative landfall cable installation method. Together, the Seagreen Alpha and Seagreen Bravo OWFs and the OTA collectively comprise 'the Seagreen Project'.

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 (the wind turbine generators (WTGs), their foundations and associated array cabling connecting the WTGs to the Offshore Substation Platforms (OSPs)), together with associated infrastructure of the OTA (the OSPs, their foundations and the offshore export cables), 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;
  - 36 WTGs installed on up to four-legged steel jackets, each installed on pin pile foundations;
- Two OSPs, each installed on up to 12 pin pile foundations; and
- A network of inter-array subsea cables as detailed below;
  - Circa 300 km of 66KV inter-array cables to connect strings of WTGs on suction bucket caissons together and to connect these WTGs to the OSP;
  - Circa 55 km of inter array cables to connect strings of WTGs on piled foundations together and to connect these WTG to the OSP;
  - Circa 3 km of interconnector cable to connect the two OSPs; and
  - Inter-array cables will be buried where possible and where burial is not possible cable protection will be provided.

Three 200kV subsea export cables, totalling circa 190 km 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 at Tealing, Angus. Export cables will be buried where possible and where burial is not possible cable protection will be put in place.

Installation of the WTGs will be phased, with Stage 1 covering installation of the 114 WTGs on suction bucket caisson jacket foundations with associated array cabling, and Stage 2 covering installation of the 36 WTGs on piled jacket foundations with associated array cabling. Installation of the OSPs will also be phased with one OSP (foundations and topsides) installed in Stage 1, and the second OSP (foundations and topsides) installed in Stage 2.

The scheduled dates for installation and commissioning of the project components are set out in the Offshore Construction Programme (LF000009-CST-OF-PRG-0002).

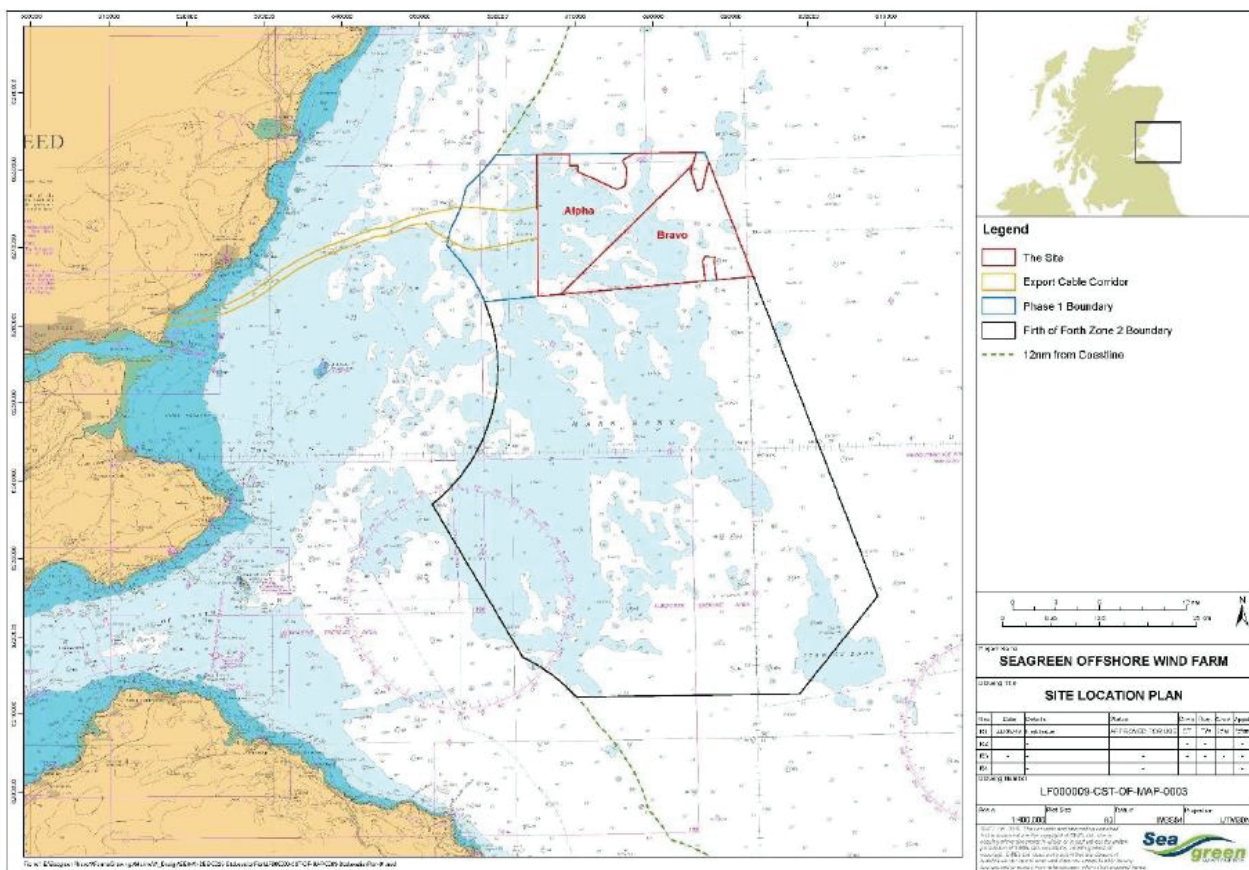


Figure 1.1 Seagreen Project Location

### 1.3 Consent and Licence Requirements

This OWF OMP has been prepared to discharge condition 16 of the S36 Consents as set out in Table 1.1. Other conditions relevant to the OWF OMP are also listed.

Table 1.1 Consent conditions to be discharged by, or connected to, this OMP

Consent document	Condition reference	Condition text	Reference to relevant section of this OMP
Section 36 consents	16	The Company must, no later than 3 months prior to the Commissioning of the first WTG, submit an Operation and Maintenance Programme (“OMP”), in writing, to the Scottish Ministers for their written approval.	This document sets out the OMP (for the Wind Farm Assets) for approval by the Scottish Ministers.
		Such approval may only be granted following consultation by the Scottish Ministers with the JNCC, SNH, SEPA, MCA, NLB, RSPB Scotland, the Planning Authority and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers.
		The OMP must set out the procedures and good working practices for operations and the maintenance of the WTG’s, substructures, and inter-array cable network of the Development	Good working practices set out in Section 5.2 with O&M procedures set out in Section 4.
		Environmental sensitivities which may affect the timing of the operation and maintenance activities must be considered in the OMP.	Set out in Section 5.1. <i>See also: LF000009-CST-OF-PLN-0001 Operations Environmental Management Plan.</i>
		Operation and maintenance of the Development must, at all times, proceed in accordance with the approved OMP (as updated and amended from time to time by the Company).	This document sets out the OMP (for the Wind Farm Assets).
		Any updates or amendments made to the OMP by the Company must be submitted, in writing, by the Company to the Scottish Ministers for their written approval.	Set out in Section 1.5.
		The OMP must, so far as is reasonably practicable, be consistent with the EMP, the PEMP, the VMP, the NSP, the CaP and the LMP.	Set out in Section 1.4.



Consent document	Condition reference	Condition text	Reference to relevant section of this OMP
Wind Farm Marine Licences 04676/19/0 and 04677/19/0	Condition 3.2.3.6	The Licensee must operate and maintain the Works in accordance with the approved OMP.	This document sets out the OMP (for the Wind Farm Assets).
		Notification must be provided at least 3 months in advance of any maintenance of the Works where any additional deposits are required.	Set out in Section 4.
		In the event that these works are not assessed in the Application and are considered by the Licencing Authority as being material they will require further Marine Licences.	Set out in Section 4.

#### 1.4 Linkages with Other Consent Plans

This OWF OMP document sets out the intended programme of O&M activities in relation to the Wind Farm Assets. A separate related OMP document sets out the intended programme of O&M activities in relation to the OTA (see document LF000009-CST-OF-PRG-0004).

Condition 16 of the S36 consents (see Table 1.1) requires this OWF OMP to be so far as it is reasonably practicable, consistent with a number of other specifically named Consent Plans as follows (in the order listed in the consent condition):

- Environmental Management Plan (EMP)
- Project Environmental Monitoring Programme (PEMP)
- Vessel Management Plan (VMP)
- Navigational Safety Plan (NSP)
- Wind Farm Cable Plan (CaP)
- Lighting and Marking Plan (LMP)

These, and other construction phase Consent Plans, will continue to apply alongside the OWF OMP between first commissioning and full commissioning, as construction and O&M activities will be carried out concurrently during this time. 'Commissioning' refers to the point of handover of the completed, operationally ready asset from the installation contractor to SWEL.

Prior to full commissioning, this OWF OMP will undergo a scheduled update during which O&M-applicable parts of a number of construction phase Consent Plans will be incorporated into this OWF OMP. This OWF OMP will then form a single source document. Figure 1.2 illustrates the process described above.

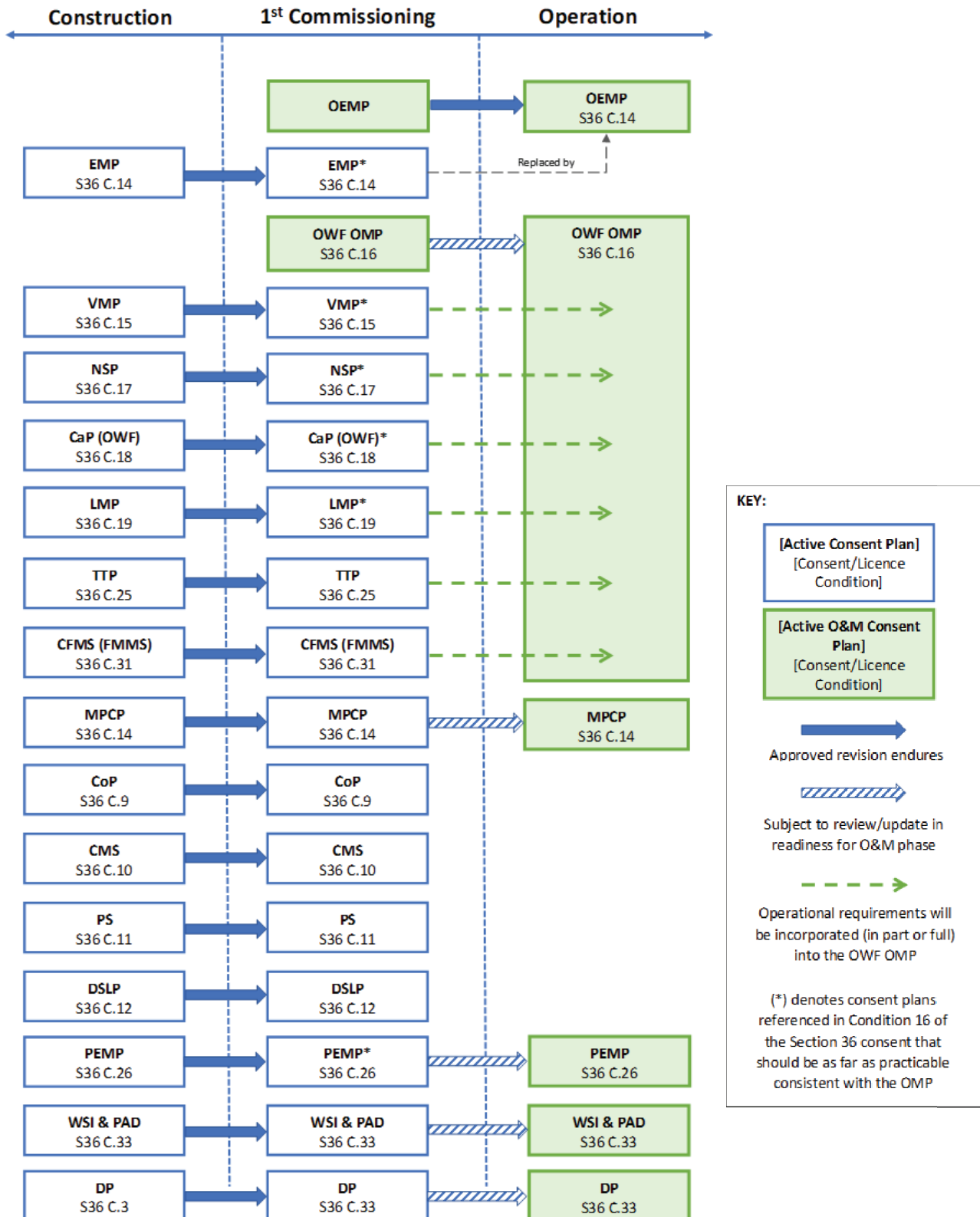
Between first and final commissioning, these Consent Plans (including those listed in Condition 16) have a link to the OMP in so far as they provide additional details on O&M activities (for example the OWF CaP and the VMP) and/or provide details on the control of O&M activities to mitigate or manage potential environmental impacts and impacts on other marine users (for example the NSP and the LMP). These Consent Plans are cross-referenced within this OMP as appropriate, however, the detail within these plans is not repeated within this OMP.

Table 1.2 summarises the linkages between this OMP and:

- Consent Plans that will be incorporated into this OMP following full commissioning (including those named in Condition 16 of the S36 Consents)
- Consent Plans that will endure following full commissioning

Consent Plans that will endure into the O&M phase will be updated accordingly upon the completion of construction activities.

Figure 1.2: Active Consent Plans during the construction and operational phases



Note: The CoP, CMS, PS and DSLP are only applicable to the construction phase and as such will not endure beyond full commissioning. The Construction EMP will apply concurrently with the OEMP between first and full commissioning (to cover ongoing construction works). After the end of construction, upon full commissioning of the development, only the OEMP will apply.

Table 1.2 Linkages between the OWF OMP and other Consent Plans

Consent Plan	Relevance to OWF OMP
<b>Consent Plans to be incorporated into the OWF OMP upon final commissioning</b>	
Vessel Management Plan (VMP) LF000009-CST-OF-PLN-0006	Provides details of ports and vessel transit routes associated with the construction and operation of the Wind Farm Assets. The VMP also outlines relevant environmental sensitivities and mitigation associated with vessel movements. Vessel activity associated with O&M activities and outlined within this OMP will be managed consistently with the procedures presented in the VMP.
Navigational Safety Plan (NSP) LF000009-CST-OF-PLN-0007	Sets out the navigational safety measures to be applied for the Wind Farm Assets including matters related to marine coordination, safety zones, routing, anchorages and notifications and communications for other sea users. The NSP will apply to all vessels involved in O&M activities. This OMP will therefore be implemented in accordance with the approved NSP.
Wind Farm Cable Plan (OWF CaP) LF000009-CST-OF-PLN-0008	Sets out Seagreen’s approach to monitoring for cable exposure and principles for developing overtrawl surveys where required. The O&M activities outlined within this OMP will be consistent with the procedures described in the OWF CaP.
Lighting and Marking Plan (LMP) LF000009-CST-OF-PLN-0010	Provides details of aviation and navigational lighting and marking of the Wind Farm Assets during construction and operation. The OMP will incorporate requirements for monitoring and mitigating any lighting failures associated with the lighting and marking strategy outlined in the LMP.
Traffic and Transportation Plan (TTP) LF000009-CST-OF-PLN-0015	Sets out traffic routes that may be affected by traffic generated by Construction of the Wind Farm Assets. Any impacts presented in the TTP will be reduced for O&M activities. Where major component repairs are required there may be occasional increases in traffic in line with the assessment presented in the RRP.
Fisheries Mitigation and Management Strategy (FMMS) (referenced in the consents as a Commercial Fisheries Mitigation Strategy - CFMS) LF000009-CST-OF-PLN-0011	Sets out the communications and mitigation strategy relating to the commercial fishing industry in order to minimise or avoid effects on fishing. This FMMS will apply to the O&M phase. This OMP will therefore be implemented in accordance with the approved FMMS.

Consent Plan	Relevance to OWF OMP
<b>Consent Plans that will be updated and remain active after final commissioning</b>	
Marine Pollution Contingency Plan (MPCP) LF000009-CST-OF-PLN-0012	Sets out the procedures to be followed in the event of a marine pollution incident or collision observed during O&M activities. The plan sets out statutory notification requirements and project-specific procedures to be followed in the event of an incident.
Project Environmental Monitoring Programme (PEMP) LF000009-CST-OF-PRG-0003	The PEMP provides an overview of the programme developed by Seagreen to monitor the environmental effects of the construction and operation of the Wind Farm Assets. The PEMP includes plans for benthic communities, bird and marine mammal monitoring. Where monitoring identifies any new information relating to environmental sensitivities, this may result in an update to the OMP, if required in accordance with the change management procedure set out in Appendix B.
Archaeology Written Scheme of Investigation (WSI) and Procedures for Archaeological Discoveries (PAD) LF000009-CST-OF-PLN-0002	The WSI sets out the mitigation procedures that must be followed in order to seek to avoid damage to cultural heritage assets and targets of archaeological potential  The PAD sets out the protocols and procedures that must be followed in the event of any unexpected archaeological discoveries whilst undertaking O&M activities.
Decommissioning Programme (DP) LF000009-CST-MA-PRG-0003	Sets out the strategy for decommissioning the Wind Farm Assets at the end of the operational lifecycle.
Operational Environmental Management Plan (OEMP) LF000009-CST-OF-PLN-0001	Details the environmental management framework for the operation of the Wind Farm Assets. The O&M activities described in this OMP will be undertaken in line with the environmental management measures described in the OEMP.

### 1.5 Document and Change Management Process

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

As detailed in section 1.4, a scheduled update of this OMP will be completed prior to full commissioning to incorporate O&M elements of those Consent Plans that will not endure beyond the construction phase, as required.

## 2. Overview of Assets

### 2.1 Wind Farm Assets

The Wind Farm Assets that make up the Seagreen Project, and covered by this OWF OMP, consist of the following main components:

- 114 Vestas V164 (10 MW) WTGs on jacket substructures each installed on suction caissons (Stage 1)
- 36 WTGs (of an as yet undetermined type) on jacket substructures each installed on pin-piled foundations (Stage 2)
- A network of 66kV inter-array cables (IACs), subsea cables connecting strings of WTGs together and to two Offshore Substation Platforms (OSPs). The network consists of 150 IACs arranged in 20 strings

The WTG locations and the arrangement of the IACs and the connections to the OSPs are shown on Figure 2.1 below. The final asset locations will be confirmed upon full commissioning as required by condition 3.2.3.2 of the OWF Marine Licences.

### 2.2 O&M Base and Marine Co-ordination Centre

The Wind Farm Assets shall be managed out of the Seagreen O&M base in Montrose. The base houses technicians and management personnel whilst Montrose Harbour provides dedicated quayside facilities for loading and unloading of crew transfer vessels (CTVs) and waste handling. The O&M base includes office and welfare facilities, spare part storage space, and also houses the Seagreen Marine Co-ordination Centre (MCC).

The Seagreen MCC shall provide the following key services:

- Work permit activation/deactivation
- Marine surveillance - vessel and personnel tracking
- Emergency response coordination
- Monitoring of the Supervisory Control and Data Acquisition (SCADA) system and HV switching (including alarm handling)

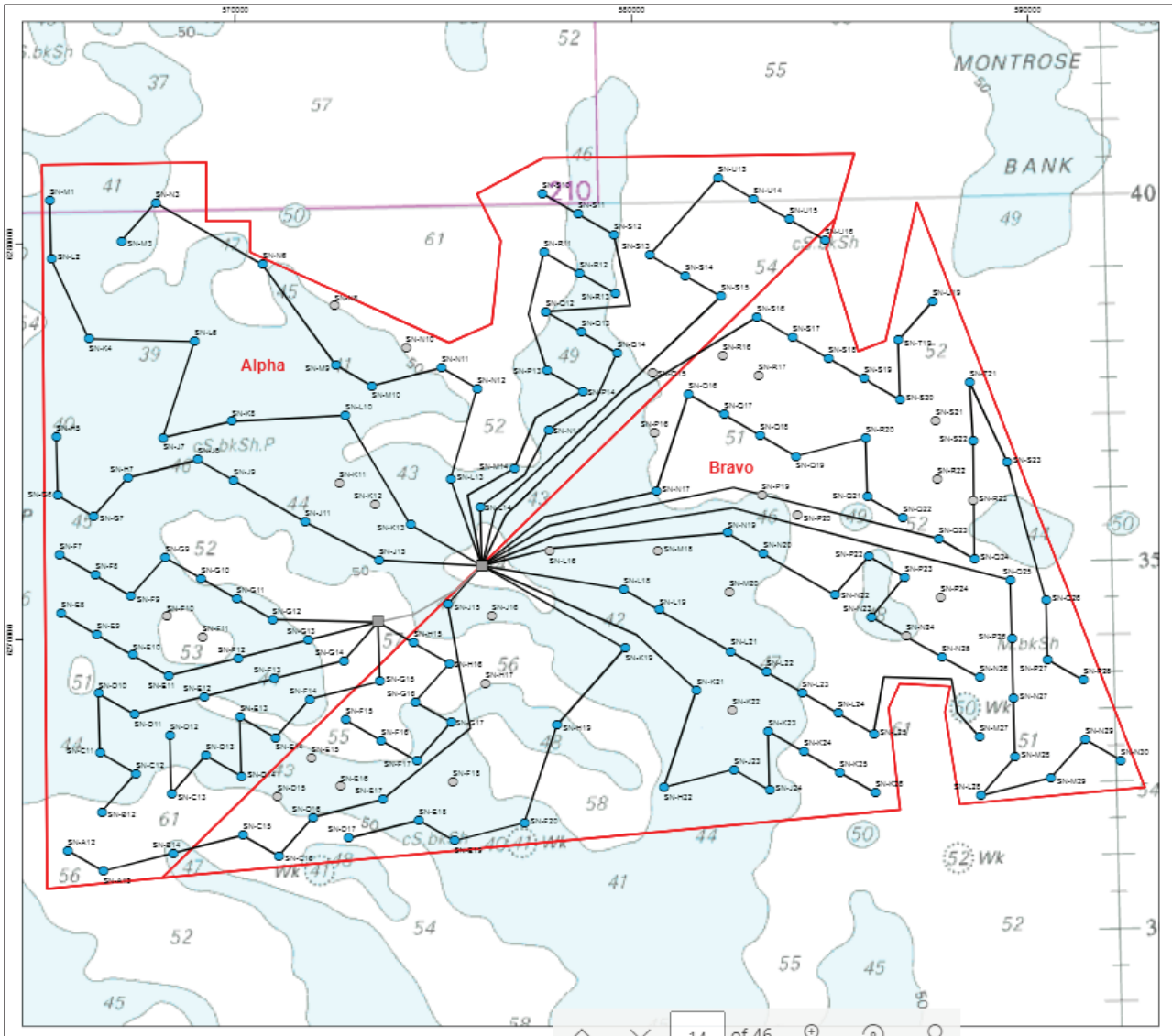


Figure 2.1 Layout of the Wind Farm Assets

### 2.3 Supervisory Control and Data Acquisition System (SCADA)

A SCADA system has been developed to provide an operator interface with the Wind Farm Assets. The SCADA system provides an interface to the WTG controllers and provides high-level performance and system information. The SCADA system will allow operatives to override automatic operation, adjust control parameters, and interrogate detailed operational and performance data.

The Wind Farm Assets SCADA system also provides remote monitoring and control of the MV/HV network allowing the complete network, or sections thereof, to be isolated or re-energised remotely. Data from the SCADA system and other monitoring devices will be integrated using a data historian to provide robust historical data to support proactive maintenance strategies and a performance-driven approach.

Day-to-day monitoring and control of the SCADA system will be the responsibility of the Control Room Operator based at the Seagreen Control Room and MCC. The SCADA system will be configured to notify operatives (via alarms) if system issues arise. It will also be possible to log in to the SCADA systems via a remote internet connection.

If any system issues arise then the Control Room Operator has the capacity to initiate shutdown of the WTGs if necessary. When intervention with the dedicated WTG controller is necessary, the operator will inform the Operations Manager, who will coordinate any remedial action as required.

### 2.4 Key Operation Programme Milestones

Table 2.1 sets out the key operation programme milestones for the Wind Farm Assets. The dates set out here align with those in the Construction Programme (LF000009-CST-OF-PRG-0002) and are subject to change as the construction phase progresses.

Table 2.1 Key operation programme milestones

Milestone	Anticipated Programme
WTG installation commencement	November 2021
Inter-array cable installation commencement	November 2021
First OSP installed and commissioned	February 2022
First WTG commissioned (start of O&M phase)	March 2022
First power exported	March/April 2022
Full commissioning of all Stage 1 WTGs	November 2022
Full commissioning of all Stage 2 WTGs / final wind farm commissioning (end of construction phase)	November 2023



### **3. Approach to Safety, Health and the Environment**

#### **3.1 Introduction**

This and the following sub-sections are intended to summarise the key elements of the overarching Seagreen commitment to Safety, Health and Environment (SHE) management.

Seagreen is committed to undertaking the O&M of the Wind Farm Assets in a way that minimises the risks to SHE, insofar as is reasonably practicable. For full details of Seagreen's overarching commitments relating to environmental management of the operation of the Seagreen Project, see Operations Environmental Management Plan (OEMP) (LF000009-CST-OF-PLN-0001).

Seagreen will require that all O&M activities have been risk assessed and that adequate control measures and actions are in place to manage the risk to as low as reasonably practicable (ALARP).

Seagreen is approaching the management of technical risk by adoption of a technical Health & Safety Management Plan in line with ALARP principles and will be producing an Operational Safety Case which will be applied to the lifecycle of the assets.

The application of the technical Health & Safety Management Plan to the O&M phase of the assets provides the necessary input to the Operational Safety Case. The Operational Safety Case provides an effective argument, with referenced substantiation, that assets are safe to operate and maintain in terms of the management of associated Significant Accident Hazard (SAH) risks to levels that are ALARP.

The overall objective of this procedure is to provide sufficient information and guidance on the process, activities, and documentation required to effectively and demonstrably manage the SAH risks associated with O&M to a level that is ALARP.

Seagreen will integrate the process, activities, and documentation identified by the technical Health & Safety Management Plan, along with overarching company SHE policies, values and standards, via the Asset Management System (AMS).

#### **3.2 Asset Management System**

Seagreen will be implementing an overarching AMS. The AMS is a software solution specifically designed for managing physical assets through their life cycle.

The scope of the AMS shall cover the operational requirements associated with the O&M activities of the Wind Farm Assets and Transmission Assets (as described in Section 2) as well as the O&M base at Montrose.

The AMS shall include operational strategies which will govern Seagreen's approach to procurement and contract management, with the Seagreen SHE procedures required as standard through conditions of contract. The operational strategies will also govern the approach to work package management which covers such activities as the development of Risk Assessment Method Statements (RAMS) and the approach to Hazard Identification Risk Assessment (HIRA).

The AMS will include key O&M manuals, plans and procedures which will be implemented with support of the Health and Safety Management System and the Environmental Management System (EMS).

Records of all O&M activity (as described in section 4) shall be maintained for audit, monitoring and reporting purposes.

Further details on the emergency response during operations will be contained in a separate Emergency Response and Cooperation Plan (ERCoP) which will be developed in consultation with the Maritime Coastguard Agency (MCA) and therefore does not form part of this OMP.

### **3.3 Environmental Management System**

In order to manage the environmental risks arising from the O&M of the Wind Farm Assets, an EMS shall be implemented.

The EMS includes processes designed to manage environmental impacts and secure environmental compliance and long-term sustainability. The EMS shall align with both the company Environmental Policy and the overarching AMS but shall also reflect the specific requirements of the consent conditions, environmental constraints, risks and opportunities specific to the Wind Farm Assets.

Full details of Seagreen's approach to the mitigation of site-specific environmental risks, consent and licence compliance and the management of contractor activity is set out in the Operations Environmental Management Plan (OEMP) (LF000009-CST-OF-PLN-0001).

This OMP, the OEMP, and the enduring Consent Plans (as illustrated in Figure 1.2) will form part of suite of EMS documentation.

## 4. Operation and Maintenance Activities

### 4.1 Maintenance Requirements

To ensure the Wind Farm Assets operate safely and in an optimised state they are subjected to a number of routine maintenance activities that are carried out on a regular basis based on Original Equipment Manufacturer (OEM) recommendations and good industry practice. In addition, there are occasions when the Wind Farm Assets may require unscheduled visits to carry out repairs or other remedial works to return the Wind Farm Assets to a serviceable condition.

If any maintenance works described in this section involve additional deposits<sup>1</sup> or other marine licensable activities (including any construction, alteration or improvement works), Seagreen will approach MS-LOT as far in advance of the proposed works as possible, to discuss the work plans and potential requirements for Marine Licences under the Marine (Scotland) Act 2010 and/or the Marine and Coastal Access Act 2009.

### 4.2 Routine Service Activities

All Wind Farm Assets are handed over to O&M with routine service recommendations and information detailing the level of servicing required. This information is used to plan and programme routine O&M activities, at appropriate frequencies.

#### 4.2.1 Jackets (foundations including suction caissons)

The specific O&M requirements and methods for the jacket foundations are provided in the O&M Manuals issued by the jacket designers.

The proposed routine inspection and maintenance activities and their indicative frequencies are listed in Table 4.1.

Remedial repairs will be made where defects are identified by visual inspection and servicing activities listed in Table 4.1.

In addition, the seabed around the suction caissons will be monitored for scour development, in accordance with engineering requirements. A post-installation survey will be conducted, and the findings used to understand the morphological and bathymetric conditions, magnitude and extent of any scour that occurs, the requirements for and timing of any future monitoring and the need for any rectification measures.

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<sup>1</sup> See condition 3.2.3.6 of the OWF Marine Licences

Table 4.1 Routine inspection and maintenance activities – jacket foundations (subject to confirmation at commencement of O&M phase)

Component	Activity	Indicative frequency
Painted areas of jacket (all 'above water' areas)	Visual inspection	Annual
	Cleaning (removal of marine growth and guano)	As required
Boat landing areas (including ladder and buffer tubes) – subject to marine growth and paint damage	Visual inspection	Prior to every CTV transfer
	Cleaning (jet wash)	As required
Ladder and transition piece working/access platforms	Cleaning (removal of marine growth and guano)	As required
Safety retracting lines (providing personal protection from falls from ladders)	Visual inspection	Prior to every use
	Service and re-certification	6-monthly
Davit crane (for transfer of materials from CTVs and for emergency evacuation of personnel)	Visual inspection	Prior to every use
	Service and re-certification <sup>2</sup>	Annual
Operational lighting (for general illumination of the structure for safe access, egress and working)	Service	Annual
Aids to Navigation (lighting, ID marker boards and foghorns)	Service	Annual
Cable terminations (in transition piece)	Inspection	Annual
Corrosion protection (CP) systems	Effectiveness checks	Annual (subset) <sup>3</sup>
Earth bonding	Integrity checks	Annual
Subsea sections of jacket structure	Visual inspection (by ROV)	Annual (subset) <sup>3</sup>
Suction caissons	Flooded member survey	Annual (subset) <sup>3</sup>
Welds	Inspection (sample)	Annual (subset) <sup>3</sup>

<sup>2</sup> A Written Scheme of Examination will be put in place to extend the 6-month inspection of the emergency man riding point on the crane

<sup>3</sup> 'Subset' indicates that in each year of operations, a subset of jacket structures will be selected for inspection/survey

#### 4.2.2 Wind Turbine Generators

SWEL has entered into a 15-year Service and Warranty Agreement (SWA) with Vestas Wind Systems ('Vestas'). The WTGs are serviced by Vestas under the SWA and require only one annual service which is carried out during the summer months when the wind resource is lower, and the sea conditions are more favourable for crew transfer. The annual service can take up to 3 weeks to complete per WTG and every main component of the WTG is inspected and serviced, working to approved written procedures. Consumable items such as filters, brake linings, carbon brushes, grease cartridges are also changed. Blade inspections are also carried out on an annual basis.

Outside the annual services, regular routine maintenance will be carried out, to include visual inspection, sampling and calibration, replacement of consumables (as necessary) and cleaning. Statutory inspections (such as pressure equipment examinations) will also be scheduled at the necessary frequencies.

Remedial repairs will be made where defects are identified during routine inspection and operation of the WTG, including via the SCADA system.

Access to the windfarm will be provided by a SOV (including the SOV daughter craft), provided by Vestas. SSE Renewables will charter additional CTVs, if required, however the strategy is to maximise the use of the Vestas provided SOV for all O&M tasks, including for balance of plant (BOP) works undertaken by SSE or other Contractors. All structures have been designed to support dual access methods. Helicopter transfers have been ruled out as a routine method of transfer on cost grounds, however helicopter access will be made possible for emergency response purposes.

After the expiry of the SWA, WTG servicing will be taken over by SSE Renewables Operations.

#### 4.2.3 Inter-Array Cables

Approximately one year following inter-array cable installation, an ROV survey will be undertaken to ensure that the cables remain as installed and to identify areas of cable at potential risk of exposure in the future. This survey will assess cable depth of burial and cable movement and identify areas of free spanning cable. Monitoring will focus on any 'at risk' areas identified. Subject to the findings of the surveys, the frequency of ongoing monitoring will be adapted to the appropriate level of exposure risk.

All inter-array cables are fitted with a thermal monitoring system that features depth of burial monitoring in near real time which will raise alarms in the control room should any variation in burial be detected. The intention is that, once this system is commissioned, any physical survey would be by exception to areas identified as seeing a change in burial depth and not on a specific periodic time basis.

In addition, the condition of the physical cable protection system (steel armour) at the jacket pull-in points will be assessed at a frequency to be determined following installation, based on the risk of damage and/or failure.

Further detail on cable exposure monitoring is set out in section 8 of the Offshore Wind Farm Cable Plan (LF000009-CST-OF-PLN-0008).

### 4.3 Unscheduled Maintenance Activities

There will be occasions when the Wind Farm Assets will require unscheduled inspections, maintenance and/or repairs. These are typically undertaken where defects are identified during the routine activities listed in Table 4.1 above. Unscheduled activities will be prioritised based on risk. For example, repairs to aids to navigation will be treated as a high priority to ensure the safety of other marine users and maintain the required operational availability. Similarly, personal safety equipment shall be treated as a high priority task. All unscheduled activity will be undertaken when weather and sea state conditions allow for a safe working environment.

Foreseeable unscheduled activities are summarised in Table 4.2 below. This table is not exhaustive, and all other works required to ensure integrity of the assets and their safe and efficient operation will be carried out as necessary.

Table 4.2 Indicative unscheduled maintenance activities

Jackets	Wind Turbine Generators	Inter-Array Cables
<ul style="list-style-type: none"> <li>• Repair/replacement of safety retracting lines and other personal safety equipment</li> <li>• Repairs to davit crane</li> <li>• Repairs to lighting (operational and navigational)</li> <li>• Repairs to navigation aids (marker boards and foghorns)</li> <li>• Paint repairs</li> <li>• ROV surveys of subsea jacket sections and caissons</li> <li>• Removal of marine growth</li> </ul>	<ul style="list-style-type: none"> <li>• WTG manual resets</li> <li>• MV switchgear operations</li> <li>• WTG SCADA alarm investigation and repairs<sup>4</sup></li> <li>• WTG wind measuring device repair/replacements</li> <li>• Other WTG component repair/replacements</li> </ul>	<ul style="list-style-type: none"> <li>• Remedial work to address exposed lengths of cable - reburial or rock placement</li> <li>• ROV surveys following a cable fault or possible damage (e.g. dragged anchor over cable trench)</li> </ul>

Unscheduled maintenance of the WTGs will be undertaken by Vestas under the SWA. If any turbine part or component fails or breaks, Vestas shall carry out unscheduled maintenance to remedy such failed or broken part or component through repair, replacement or (when appropriate) reset (the choice between those forms of remedy being in the Vestas sole and exclusive discretion) and perform all diagnostic services that Vestas determines are necessary with respect to such part or component.

After the expiry of the SWA, WTG maintenance will be taken over by SSE Renewables Operations

Further details on cable exposure monitoring, reburial and cable failure are set out in the Offshore Wind Farm Cable Plan (LF000009-CST-OF-PLN-0008).

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<sup>4</sup> Component replacements are limited by lifting capacity of davit/nacelle cranes or helicopter payload limits

Specialist contractors shall be appointed to undertake unscheduled maintenance of the jackets, jacket-mounted equipment and the inter-array cables.

Structural health monitoring (SHM) systems shall be retrofitted to the WTGs at a date to be confirmed following commissioning.

#### **4.4 Major Component Repairs**

Major component repairs are considered to be unforeseen faults that could trigger emergency repairs requiring large component replacements and extensive remedial works.

For major maintenance works such as major component exchanges, Seagreen will approach MS-LOT as far in advance of the proposed works as possible, to discuss the work plans and potential associated Marine Licence requirements.

In relation to the WTGs, major component repairs may involve replacement of generator components (e.g. nacelle, blades, etc.) or entire WTGs or repairs to their substructures. Such events would require mobilisation of specialist vessels. Timescales for repair works would largely be driven by the availability of replacement parts, specialist personnel, equipment and vessels. Vestas are responsible for WTG main component replacements, including provision of jack-up or crane vessels, as and when required. Vestas are also responsible for any seabed survey work required in advance. SWEL are required to provide any survey data they have for a particular jack up location to assist with a campaign.

In relation to the inter-array cables, major component repairs may involve the removal and/or replacement of cables. Where ROV surveys identify a fault on an IAC, the full length of cable may be removed from the seabed and replaced. Such activities would be performed by specialist cable vessels. Cable re-trenching and/or installation of protection would likely be required.

All major component repair and replacement works would be planned and notified in advance to marine stakeholders who may be affected by the works (including, but not limited to, local mariners, fisheries organisations, harbour authorities and HM Coastguard) via Notices to Mariners issued by the Seagreen MCC.

## 5. Environmental Sensitivities and Good Working Practices

### 5.1 Environmental Sensitivities

Environmental sensitivities within the wind farm lease area have been identified during baseline surveys and desk-based reviews to support the Environmental Statement (ES) and Supplementary Environmental Information Statement (SEIS) supported by additional survey work undertaken as part of the PEMP.

Potential impacts from routine O&M activities (as described in Section 4.1) are associated mainly with vessel movements and the presence of vessels within the wind farm lease area. Service and inspection works will predominately take place on the WTG structures with limited interaction with marine species and habitats. No periods of increased environmental sensitivity were identified in the ES and SEIS relevant to vessel disturbance from O&M activities and no significant effects were predicted.

Unscheduled activities and, in particular, some major component replacements and repairs will have a greater interaction with environmental receptors. Table 5.1 outlines key environmental sensitivities considered in respect of the O&M activities set out in Section 4.

*Table 5.1 Environmental considerations associated with O&M activities*

Receptor	Sensitivities	Seasonal considerations
<b>Benthic ecology</b>	The impacts of maintenance of inter-array cables and other seabed infrastructure, including the use of jack-up vessels, were considered to be negligible in the ES and SEIS due to the localised and short-term nature of disturbance of the benthos.	None identified
<b>Fish and shellfish</b>	The ES and SEIS noted sensitive periods during spawning for herring (August-September) and cod (April). However, potential significant effects were noted as a result of pile-driving noise and there will be no such pile-driving in the O&M phase.  Effects in relation to O&M activities, including effects from major component repairs or replacements and vessel activity, were not identified as a primary concern and impacts were not assessed in the ES or SEIS.	None identified



Receptor	Sensitivities	Seasonal considerations
<b>Marine mammals</b>	The impacts of vessel activity on marine mammals in the O&M phase were considered to be negligible in the ES and SEIS, both in terms of vessel noise and collision risk.  Effects in relation to other O&M activities were not identified as a primary concern and impacts were not assessed in the ES or SEIS.	None identified
<b>Ornithology</b>	Effects in relation to O&M activities, including effects from major component repairs or replacements and vessel activity, were not identified as a primary concern and impacts were not assessed in the ES or SEIS.	Post colony dispersal of auks takes place in the last two weeks of July and first two weeks of August. Large rafts of birds may be present on the sea at this time. Mitigation measures are described in the VMP and EMP
<b>Commercial fisheries</b>	The impacts of vessel activity (CTV and SOV) on commercial fisheries in the O&M phase are likely to be minimal. However, fishing activity may be temporarily displaced during major maintenance and post-construction survey activity. The FMMS shall be followed at all times to manage interactions and mitigate impacts.	None identified

No other sensitivities or seasonal considerations have been identified, both in the ES and subsequently. The results of the monitoring undertaken in accordance with the Project Environmental Monitoring Programme may indicate additional sensitivities which may necessitate changes to the O&M approach. In these cases, this OWF OMP will be updated accordingly.

Should additional marine licences be required for major maintenance activities, environmental assessments would be conducted to ensure appropriate mitigations are in place for the duration of the works.

## 5.2 Good Working Practices

Seagreen will require that good working practice is applied by Seagreen personnel and contractors throughout O&M, seeking to minimise the risks to personnel, other sea users and the environment.

Good working practices applicable to O&M are set out in the approved Consent Plans detailed in Section 0 and Table 1.2.

There are a number of good practice guidance documents that have been produced for or apply in relation to the offshore renewables industry in recent years. Where relevant, Seagreen will require that such good practice is reflected in procedures and method statements produced by Seagreen personnel and contractors, noting that all such guidance shall be applied to the specific location/jurisdiction, design, operational requirements and ES commitments of the Seagreen project. Relevant industry guidance documents are listed in Appendix C.

The OEMP sets out a range of environmental management procedures to be applied throughout the O&M phase to manage and mitigate environmental risk. The OEMP will be relevant throughout the operational lifetime of the Wind Farm Assets from first commissioning until decommissioning.

## 6. Compliance with the ES and ES Addendum

The relevant conditions of the S36 Consent require that the Seagreen Project be operated in accordance with the terms of the application, including the ES and ES Addendum.

The ES and ES Addendum for the Seagreen project detailed the proposed approach to O&M and included a number of mitigation commitments specific to O&M activities. Appendix D presents the commitments made by Seagreen in the ES and ES Addendum to mitigation measures in relation to O&M. The table provides details of the commitments and a cross-reference to where each commitment is implemented in this OMP or in other Consent Plans. A complete register of the mitigation, management and monitoring commitments made in the ES and ES Addendum, required by consent conditions is set out in the Commitments Registers included as part of the OEMP.

## 7. References

Table 7.1 Seagreen Document References

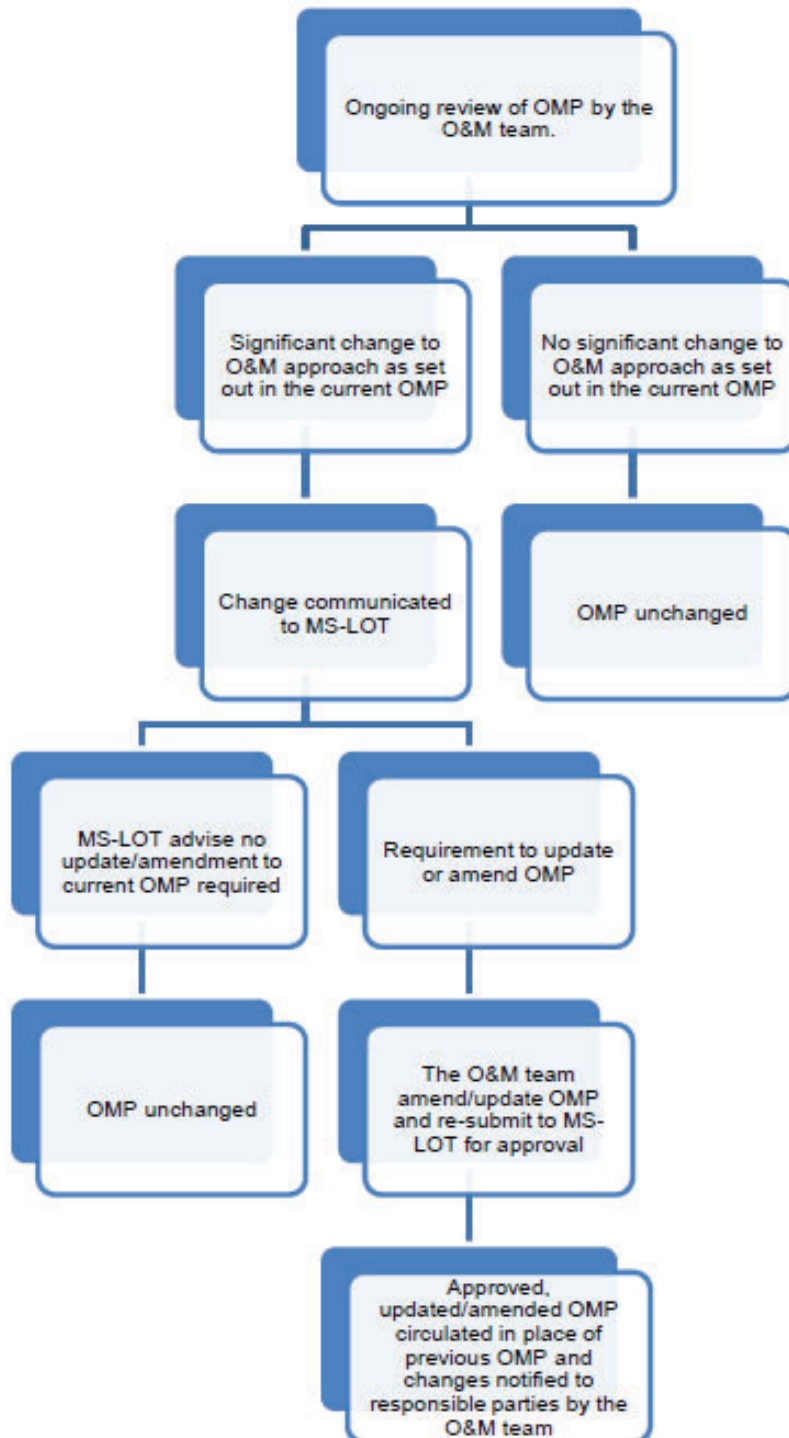
SWEL Document Number	Title
LF000009-CST-OF-PRG-0004	Offshore Transmission Assets Operations and Maintenance Plan
LF000009-CST-OF-PLN-0001	Operations Environmental Management Plan
LF000009-CST-OF-PLN-0014	Construction Environmental Management Plan
LF000009-CST-OF-PLN-0006	Vessel Management Plan
LF000009-CST-OF-PLN-0007	Navigational Safety Plan
LF000009-CST-OF-PLN-0008	Offshore Wind Farm Cable Plan
LF000009-CST-OF-PLN-0010	Lighting and Marking Plan
LF000009-CST-OF-PLN-0015	Traffic and Transportation Plan
LF000009-CST-OF-PLN-0011	Fisheries Mitigation and Management Strategy
LF000009-CST-OF-PLN-0012	Marine Pollution Contingency Plan
LF000009-CST-OF-PRG-0003	Project Environmental Monitoring Programme
LF000009-CST-OF-PLN-0002	Marine Archaeology Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD)
LF000009-CST-MA-PRG-0003	Decommissioning Programme

## Appendix A – OMP List of Abbreviations and Definitions

Term	Description
AC	Alternating Current
ADP	ALARP Design Procedure
ALARP	As low as reasonably practicable
AMS	Asset Management System
CMS	Construction Method Statement
Consent conditions	The terms that are imposed on Seagreen under the S36 Consents or Marine Licence(s) that must be fulfilled throughout the period that the consents or licences are valid
Consent Plan	Plan requiring approval by Scottish Ministers and as stated within the conditions of the Section 36 Consent and/or Marine Licence(s)
Contractor	A contractor appointed by to carry out O&M work packages
CoP	Construction Programme
CTV	Crew Transfer Vessel
DSLDP	Development Specification and Layout Plan
EMP	Environmental Management Plan
EMS	Environmental Management System
ERCoP	Emergency Response and Co-operation Plan
ES	Environmental Statement
HIRA	Hazard Identification and Risk Assessment
HV	High Voltage (220kV or above)
IAC	Inter-array cable
JNCC	Joint Nature Conservation Committee
kV	kilovolts
LMP	The Lighting and Marking Plan
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	A written consent granted by the Scottish Ministers under Part 4 of the Marine (Scotland) Act 2010 and/or Part 4 of the Marine and Coastal Access Act 2009

Term	Description
MCA	Maritime and Coastguard Agency
MPCP	Marine Pollution Contingency Plan
MS-LOT	Marine Scotland Licensing and Operations Team
MV	Medium Voltage (33kV)
NLB	Northern Lighthouse Board
NSP	Navigational Safety Plan
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer. The OEM is a company that produced parts and/or equipment that now forms part of the Wind Farm Assets.
OEMP	Operations Environmental Management Plan
OMP	Operation and Maintenance Programme
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
OWF CaP	Offshore Wind Farm Cable Plan
PAD	Protocol for Archaeological Discoveries
PEMP	Project Environmental Monitoring Programme
RAMS	Risk Assessment and Method Statement
ROV	Remotely Operated Vehicle
S36 consent	The written consent granted by the Scottish Ministers under Section 36 of the Electricity Act 1989
SAH	Significant Accident Hazard
SCADA	Supervisory Control and Data Acquisition
SEIS	Supplementary Environmental Information Statement
SHE	Safety, Health and Environment
SNH	Scottish Natural Heritage (now known as NatureScot)
TTP	Traffic and Transportation Plan
VMP	The Vessel Management Plan
Wind Farm Assets	The assets forming the Seagreen Alpha and Seagreen Bravo OWFs (as defined in the Section 36 Consents): the WTGs, their foundations, and the IACs up to - but not including - the OSPs
WTG	Wind Turbine Generator

## Appendix B – The OWF OMP Change Management Procedure



Note: ‘Significant’ changes to O&M approach may include changes to contracting arrangements, major emerging maintenance requirements based on manufacturer recommendations or results of ongoing monitoring, changes in response to incidents or asset failures, new/updated legislative requirements or industry good practice guidance. Seagreen will consult with MS-LOT with regard to the significance of any changes and the requirement to update this OMP.

### Appendix C – Good Working Practice Guidance

Note: Where guidance listed here is revised, the most up to date version shall apply. As guidance develops, some guidance listed here may be superseded or become obsolete. While every effort will be made to keep this Appendix up to date, contractors are required to ensure they refer to the most up to date guidance and to any other guidance not listed here that is applicable to their work scope.

Publisher	Title	Scope
G+	Working at height in the offshore wind industry (2 <sup>nd</sup> edition - July 2018)	Covering design, construction, commissioning, and operation; designed to reduce the need for work at height; topic guidance sheets, covering common hazards, personal protective equipment, training and competence, fitness requirements, and the responsibilities of those procuring, supervising and undertaking work; with supporting information, such as regulatory requirements in selected EU countries (including the UK) and technical standards
	The safe management of small service vessels used in the offshore wind industry (2 <sup>nd</sup> edition - January 2018)	Cover working with vessels that have a gross tonnage of less than 500, such as crew transfer vessels, guard vessels, survey vessels and construction support vessels. The guidelines cover audit and inspection regimes for wind farm service vessels, operating procedures for routine marine operations, training and competence of crew and passengers, and safety equipment
	Integrated Offshore Emergency Response (IOER) – Good practice guidelines for offshore renewable energy developments (1 <sup>st</sup> edition – October 2019)	Guidance on identifying offshore renewables risks and planning and delivery of an effective emergency response
	Good practice guidelines – Offshore wind farm transfer (1 <sup>st</sup> edition – July 2020)	Guidance on executing safe transfers of personnel in an offshore wind farm
	Good practice guidelines for safe helicopter operations in support of the global offshore wind industry (1 <sup>st</sup> edition – February 2021)	Guidance on the planning and execution of safe helicopter operations for logistical support and emergency response in offshore wind farms



Publisher	Title	Scope
Energy Institute	UK Wind Turbine Safety Rules (4th edition - 2021)	A model template of rules and procedures to help formalise a safe system of work to manage the significant risks associated with a wind turbine
Renewables UK	Offshore Wind and Marine Energy H&S Guidelines (Issue 2 – 2014)	H&S guidelines for the offshore wind sector covering all phases of development and identifying risks and significant safety hazards and activities
	Safety Circular: Notices to Mariners. Guidance for Offshore Wind & Marine Projects (2013)	This Circular provides a short summary of the accepted scope and format for issuing Notices to Mariners
	FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (2014)	Sets out best practice guidance on liaison between the offshore wind industry and the fishing industry
	Guidelines for Selection and Operation of Jack-ups in the Marine Renewable Energy Industry (Issue 2 - 2013)	Industry guidance aimed at jack-up owners, operators, developers and contractors engaged in site-investigation, construction, O&M of offshore wind and marine energy installations
	First Aid Needs Assessment – Guidance for renewable energy projects (2013)	Provide basic information on how duty holders can assess the provision of adequate and appropriate equipment, facilities and personnel to ensure employees receive proper attention if they are injured or taken ill at work.
	Vessel Safety Guide - Guidance for offshore renewable energy developers (2015)	Provides guidance and insight on the selection and maintenance of vessels through all phases of wind farm development
NatureScot	The Scottish Marine Wildlife Watching Code (2017)	A code of conduct for marine users who may encounter marine wildlife during their activities, aiming to minimise the risk of harm to marine wildlife and minimise disturbance
MCA	The Workboat Code (2014)	Construction standard for small workboats (<24m load line length) in commercial use

### Appendix D - Summary of O&M Activities (as proposed in ES and ES Addendum)

Source	Reference (ES Chapter)	Details of commitment	Implementation
ES September 2012	Project Description – 5.233	O&M of the OWFs after commissioning will comprise of both scheduled and unscheduled events. Scheduled works on the WTGs and offshore electrical infrastructure will include annual or bi-annual maintenance, statutory inspection and routine inspection visits. When necessary, retrofitting and upgrading works may also take place. The scheduled works will normally be timetables for the summer months, given the more typically settled weather and longer day light hours.	Section 4.2 – Routine Service Activities Section 4.3 – Unscheduled Maintenance Activities Section 4.4 – Major Component Repairs
ES September 2012	Project Description – 5.235	The current technology of WTGs will require a major service every 12 months; they will also require periodic visits in the event the WTG experiences a fault which cannot be remotely reset. In addition WTGs will require gearbox oil changes every 5 years. In certain circumstances large components such as gearboxes and blades may also need to be replaced. In this case a large crane vessel or jack-up, similar to that used for WTG installation, will be used to carry out the necessary works.	Section 4.2 – Routine Service Activities Section 4.3 – Unscheduled Maintenance Activities Section 4.4 – Major Component Repairs
ES September 2012	Project Description – 5.236	Unscheduled repair activities will range from attendance on location to deal with the resetting of false alarms to major repairs.	Section 4.3 – Unscheduled Maintenance Activities Section 4.4 – Major Component Repairs
ES September 2012	Project Description – 5.238	The Project Alpha and Project Bravo operators will have an O&M team in place for the day-to-day management and control of the OWF infrastructure. This is expected to be based in purpose built onshore O&M Control Centre facilities, ideally situated on the quayside at the chosen operations port location.	Section 2.2 - O&M Base and Marine Co-ordination Centre

Source	Reference (ES Chapter)	Details of commitment	Implementation
ES September 2012	Project Description – 5.239	In order to manage the post consent and ongoing site monitoring requirements, it is likely that a combination of dive support vessels and ROVs will be used to undertake inspection of foundations, scour protection, cables and any other subsea infrastructure.	Section 4.2 – Routine Service Activities
ES September 2012	Project Description 5.240	Transport of the WTG major components for replacement will normally take place by sea. It is expected that these will be shipped from the manufacturing base and loaded onto the vessel from larger ports for transport directly to the OWF sites. There will therefore be a need to use large vessel mounted cranes in order to replace defective components such as generators, gearboxes and blades. Detailed planning of the work and travelling time will be undertaken to keep transit as short as possible and maximise available durations for lifting operations and installation activities.	Section 4.4 – Major Component Repairs Vessel Management Plan (subject to update)