Seagreen Offshore Wind Farm

Offshore Wind Farm Construction Method Statement

April 2020

Project Title	Seagreen Wind Energy Ltd
Document Reference Number	LF000009-CST-OF-MST-0001

Offshore Wind Farm Construction Method Statement

Section 36 Consent Condition 10

For the approval of Scottish Ministers

Rev	Date	Reason for Issue	Originator	Checker	ECoW	Approver
02	24/04/2020	For approval	RPS Group Ltd			

Table of Contents

Consent Plan Overview

Purpose of the Construction Method Statement (CMS)

This Construction Method Statement 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 Condition 10 of 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 OTA are collectively referred to as the 'Seagreen Project'.

The overall aims and objectives of the CMS are to set out the construction procedures and good working practices for the installation of the Seagreen OWF infrastructure. A separate CMS (LF000009-CST-OF-MST-0002) has been prepared for the installation of the Seagreen Offshore Transmission Asset (OTA) infrastructure.

The CMS demonstrates that the construction procedures to be employed align with those set out within the Environmental Statement (ES) and ES Addendum and that construction related mitigation measures detailed within the ES and ES Addendum will be applied during installation.

All Seagreen Contractors (including their Sub-Contractors) involved in the Seagreen OWF Project are required to comply with this CMS through conditions of contract.

Structure of the CMS

The **CMS** is structured as follows:

Section 1&2	Provides an overview of the Seagreen OWF Project and the consent requirements that underpin the content of this CMS. It also sets out linkages with other consent plans, construction management and the process for making updates and amendments.
Section 3	Sets out the scope and objectives of the CMS, and outlines the structure of the document.
Section 4	Outlines the relevant roles of the personnel involved in the construction of the project, the responsibilities of each role and the chain of command throughout the construction phase. Contact details of each key role are also provided.
Section 5	Sets out the Seagreen construction management framework for the Seagreen OWF Project with reference to industry guidance, including in relation to health and safety and environmental management, and provides information on Seagreen's expectations for training and experience for those involved in the construction of the project.
Section 6	Provides the construction procedures for each component of the Seagreen OWF Project including key parameters and methodologies and highlights relevant mitigation commitments and good working practices.
Section 7	Demonstrates compliance with the original application and commitments made.
Section 8	Lists the references made within this CMS.
Appendix A	List of abbreviations and definitions
Appendix B	The CMS change management procedure
Appendix C	Compliance with the ES parameters and process
Appendix D	Summary of mitigation commitments
Appendix E	Pro-forma and contact details for key Seagreen personnel, contractors and sub-contractors

Scope of the CMS

This CMS covers, in line with the requirements of the condition 10 of the S36 Consents, industry standards and good practice, the following:

- Construction procedures in relation to foundations and substructures, including transition pieces, wind turbine generators (WTGs), inter-array cables and the cables from the WTGs up and onto the Offshore Substation Platforms (OSPs);
- Good working practices to be employed during construction;
- Details of the roles and responsibilities, chain of command and contact details of company personnel, contractors and sub-contractors; and
- Details of how construction related mitigation steps proposed in the ES and ES Addendum are to be delivered.

CMS Audience

This CMS 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 CMS 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 this CMS are to be held in the following locations:

- Seagreen's head office;
- Seagreen's construction office and Marine Co-ordination Centre;
- At the premises of any Contractor, including the Seagreen ECoW, appointed by Seagreen; and
- Aboard any vessel engaged in OWF operations.

1. Introduction

This Construction Method Statement 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 Condition 10 of 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.

The overall aims and objectives of the CMS are to set out the construction procedures and good working practices for installing the Seagreen OWF Project.

The CMS is in accordance with the construction methods assessed in the Application and with other Seagreen consent plans noted in Condition 10 of the S36 Consents as far as is reasonably practicable.

2. Project Background and Consents

2.1 Project Overview

Seagreen Alpha and Seagreen Bravo OWFs and the Offshore Transmission Assets (OTA) are collectively referred to as the 'Seagreen Project'. The Seagreen Project is located in the North Sea, in the outer Firth of Forth and Firth of Tay region and comprises the Seagreen OWF Project (the WTGs, their foundations, associated array cabling and cables from the WTGs up and onto the OSPs), together with associated infrastructure of the Seagreen OTA Project (OSP, 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 2.1.

The Seagreen Project will consist of the following key components:

- 150 WTGs comprising;
- 114 WTGs installed on three leg steel jacket foundations, 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;
- A network of inter-array subsea cables as detailed below;
    - Circa 300km of inter-array cables to connect strings of WTGs on suction bucket caissons together and to connect these WTGs to the OSP
    - Circa 55km of inter array cables to connect strings of WTGs on piled foundations together and to connect these WTG to the OSP; and
    - Circa 3km of interconnector cable to connect the two OSPs
    - Inter-array cables will be buried where possible and where burial is not possible cable protection will be provided

- 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.

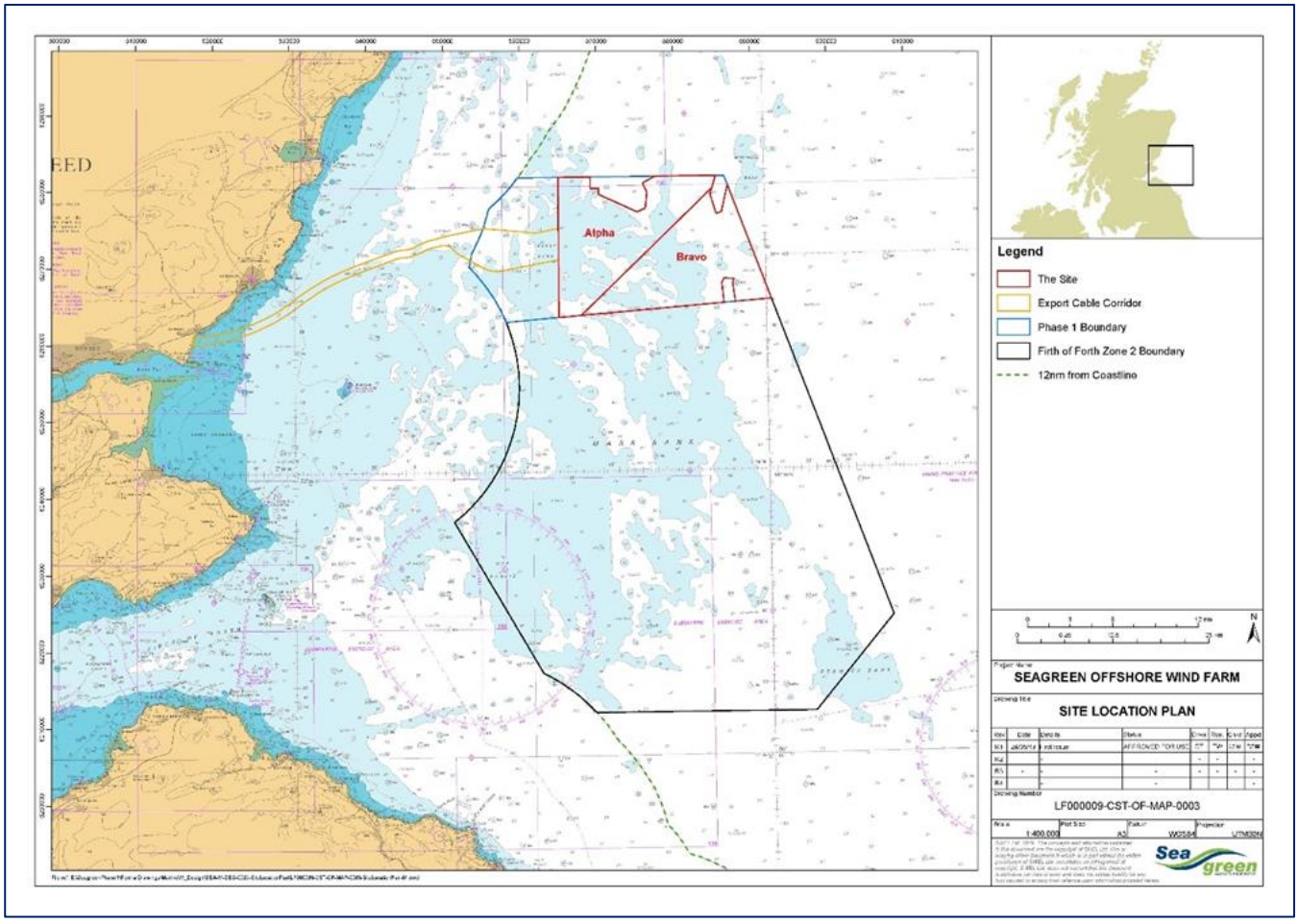


Figure 2.1: Project location.

2.2 Consent and Licence Requirements

This CMS has been prepared to discharge condition 10 of the S36 Consents as set out in Table 2.1.

Table 2.1: Consent conditions to be discharged by this CMS.

Consent document	Condition reference	Condition text	Reference to relevant section of this CMS
Section 36	Condition 10	The Company must, no later than 6 months prior to the Commencement of the Development submit a CMS, in writing, to the Scottish Ministers for their written approval.	• The submission of the CMS document satisfies the condition

Consent document	Condition reference	Condition text	Reference to relevant section of this CMS
		Such approval may only be granted following consultation by the Licensing Authority with the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH), the Scottish Environment Protection Agency (SEPA), the Maritime and Coastguard Agency (MCA), the Northern Lighthouse Board (NLB), Angus Council and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	• Consultation will be carried out by MS-LOT as part of the approval process
		The CMS must set out the construction procedures and good working practices for installing the Development.	• Section 6 - Construction procedures, mitigation and good working practices
		The CMS must also include details of the roles and responsibilities, chain of command and contact details of company personnel, any contractors or sub-contractors involved during the construction of the Development.	• Section 4 - Roles and responsibilities
		The CMS must be in accordance with the construction methods assessed in the Application and must include details of how the construction related mitigation steps proposed in the ES and in the ES Addendum are to be delivered.	• Section 6 - Construction procedures, mitigation and good working practices • Section 7 - Compliance with the ES and ES Addendum • Appendix C - Compliance with the ES • Appendix D - Summary of mitigation commitments
		The Development must, at all times, be constructed in accordance with the approved CMS (as updated and amended from time to time by the Company).	• Section 7– Compliance with the ES and ES Addendum
		Any updates or amendments made to the CMS by the Company must be submitted, in writing, by the	• Section 2.4 - Updates and Amendments • Appendix B – The CMS change management procedure

Consent document	Condition reference	Condition text	Reference to relevant section of this CMS
		Company to the Scottish Ministers for their written approval.	
		The CMS must, so far as is reasonably practicable, be consistent with the Design Statement (DS), the Environmental Management Plan (EMP), the Vessel Management Plan (VMP), the Navigational Safety Plan (NSP), the Piling Strategy (PS), the Cable Plan (CaP), and the Lighting and Marking Plan (LMP)	• See Section 2.3 – Linkages with other consent plans and Consent Conditions

2.3 Linkages with other consent plans and Consent Conditions

The CMS will so far as is reasonably practicable be consistent with a number of other consent plans as set out in S36 Consent condition 10. These are set out in Table 2.2 below with details of the linkages presented and cross referenced as appropriate.

It should be noted that information is not repeated across consent plans, rather, where pertinent information is available in linked consent plans, the relevant consent plans are referred to. The plans are not required for approval of the CMS but cross-references are provided for information.

Table 2.2: Linkages with other consent plans.

Reference (consent plan title)	Consent (condition in parenthesis)	Linkage with the CMS	Cross-reference in this CMS
Design Statement (DS)	S 36 (13)	The DS includes representative wind farm visualisations from key viewpoints, based upon the final Design Specification and Layout Plan (DSLP).	• Section 6 - Construction procedures, mitigation and good working practices • Appendix C - Compliance with the ES
Environmental Management Plan (EMP)	S 36 (14)	The EMP provides the overarching framework for environmental management during the construction and operational phases of the Seagreen OWF Project. Environmental management measures have been integrated into the construction procedures set out within this CMS, with cross-reference to the EMP.	• Section 4 - Roles and responsibilities • Section 6 - Construction procedures, mitigation and good working practices

Reference (consent plan title)	Consent (condition in parenthesis)	Linkage with the CMS	Cross-reference in this CMS
			• Section 7 - Compliance with the ES and ES Addendum • Appendix C - Compliance with the ES • Appendix D - Summary of mitigation commitments
Vessel Management Plan (VMP)	S 36 (15)	The VMP sets out the number, types and specification of vessels required during construction and operation, including vessel management procedures and vessel coordination, and location of ports and vessel transit corridors.	• Section 6 - Construction procedures, mitigation and good working practices
Navigational Safety Plan (NSP)	S 36 (17)	The NSP addresses navigational safety measures, construction exclusion zones, Notice(s) to Mariners and Radio Navigation Warnings, anchoring areas, temporary construction lighting and marking, emergency response and coordination arrangements for the construction, operation and decommissioning phases of the Development, and buoyage.	• Section 6 – Construction procedures, mitigation and good working practices • Section 7 Compliance with the ES and ES Addendum • Appendix C - Compliance with the ES parameters and processes • Appendix D - Summary of mitigation commitments
Piling Strategy (PS)	S36 (11)	The PS is required to include details of the proposed method and anticipated duration of pile-driving, details of soft-start piling procedures and anticipated maximum piling energy required, and details of any mitigation and monitoring to be employed during pile-driving.	• Section 6 – Construction procedures, mitigation and good working practices

Reference (consent plan title)	Consent (condition in parenthesis)	Linkage with the CMS	Cross-reference in this CMS
Cable Plan (CaP)	S36 (18)	The CaP provides details of the location and installation techniques for the inter-array cables, the results of survey work to inform cable routing, technical specification of the cables, a burial risk assessment, and methodologies for survey and monitoring of cables during the operational phase.	• Section 6 - Construction procedures, mitigation and good working practices • Section 6.7 - Stage 5: Inter-array cable installation
Lighting and Marking Plan (LMP)	S36 (19)	The LMP provides the aviation and navigational lighting and marking arrangements for the Seagreen OWF Project.	• Section 6 - Construction procedures, mitigation and good working practices

2.4 Updates and Amendments

Should any updates to the CMS become necessary, the change management process for any updates required to the CMS, including resubmission of consent plans for approval, is outlined in Appendix B – The CMS change management procedure.

3. Scope and Objectives of the CMS

3.1 Scope and Objectives

The overall aims and objectives of the CMS are to set out the construction procedures and good working practices for installing the Seagreen OWF Project. The CMS includes:

- Detailed construction procedures in relation to foundations and substructures, transition pieces, WTGs, inter-array cables and WTG to OSP cables;
- Details of the roles and responsibilities, chain of command and contact details of company personnel, contractors and sub-contractors; and
- Details of how construction related mitigation steps proposed in the ES and ES Addendum are to be delivered.

The CMS is in accordance with the construction methods assessed in the Application and is consistent with other Seagreen consent plans as far as is reasonably practicable.

4. Roles and responsibilities

4.1 Overview

This section sets out the key roles and responsibilities and chain of command in relation to the CMS. It identifies each key role involved in the construction phase of the Seagreen OWF Project and lists responsibilities associated with each role in relation to the CMS.

Figure 4.1 illustrates the key roles and chain of command in relation to the CMS.

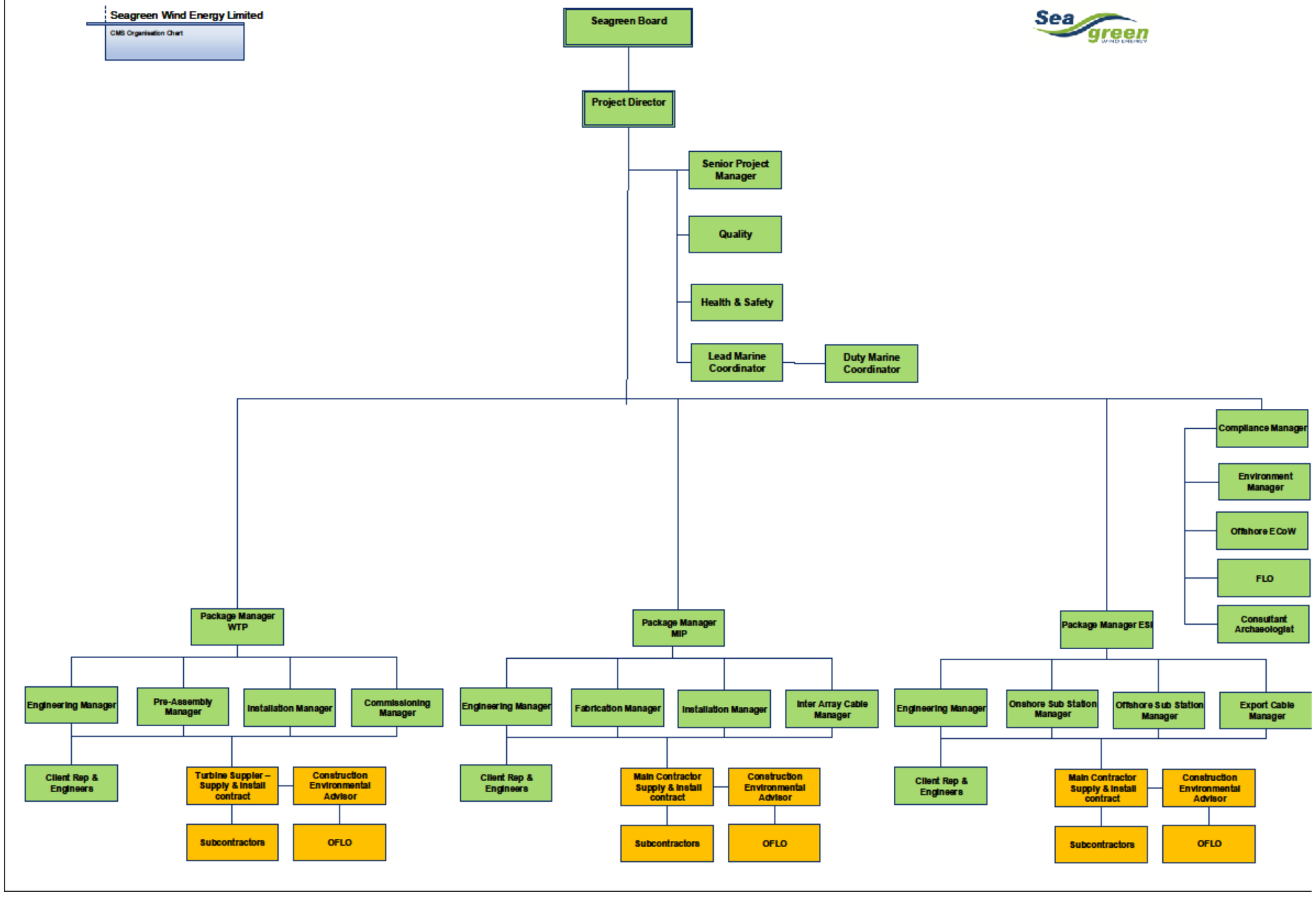


Figure 4.1: Chain of command and lines of communication.

For full details of roles and responsibilities in relation to environmental management of the Seagreen OWF Project construction phase please refer to the Offshore CEMP (LF000009-CST-OF-PLN-0014).

4.1.1 Seagreen Project Director

The Seagreen Project Director is accountable to the Seagreen board and has overall responsibility for requiring that the Seagreen OWF Project is constructed and operated in accordance with the CMS and associated consent plans. The Seagreen Project Director has overall responsibility for project delivery and governance.

4.1.2 Seagreen Project Manager

The Seagreen Project Manager has responsibility for overseeing the construction phase of the Seagreen OWF Project and requiring compliance with all consent conditions and associated consent plans.

4.1.3 Seagreen Quality Manager

The Seagreen Quality Manager is responsible for requiring the maintenance of high quality standards throughout delivery of the Seagreen OWF Project.

4.1.4 Seagreen Safety Health and Environment (SHE) Manager

The Seagreen SHE Manager is responsible for advising on SHE aspects of the Seagreen OWF Project and is responsible for the overall incident reporting process (see Incident Reporting Procedure - LF000009-HSE-MA-PRO-0008).

4.1.5 Seagreen Lead Marine Coordinator

The Seagreen Marine Coordinator is responsible for the monitoring of people, vessels and offshore structures with regards to the safe preparation and execution of offshore construction activities. The Lead Marine Coordinator is supported by each of the Duty Marine Coordinators. The Duty Marine Coordinator is the person responsible for the role when they are on duty.

4.1.6 Seagreen Package Managers

The role of the Seagreen Package Managers is to oversee the delivery of discreet construction work packages and to establish contractual obligations for contractors (and their sub-contractors) in relation to the CMS, and to requiring compliance with these contracts. These roles include the WTG Package Manager, Marine Installation Package (MIP) Manager and Electrical System Installation (ESI) Package Manager.

4.1.7 Seagreen Client Representative

The Seagreen Client Representative will be based on site or aboard construction vessels and will be responsible for monitoring the implementation of the agreed construction procedures.

4.1.8 Seagreen Marine Coordinator

The Seagreen Marine Coordinator is responsible for the monitoring of people, vessels and offshore structures with regards to the safe preparation and execution of offshore construction activities.

4.1.9 Seagreen Compliance Manager

The Seagreen Compliance Manager (CM) manages a team (the 'Compliance Team') responsible for requiring contractor compliance with the Seagreen OWF Project consents and environmental legislation, on behalf of Seagreen.

The responsibilities extend across both Offshore and Onshore activities so that a consistent approach to compliance and environmental management is applied. The Compliance Team includes the Seagreen Environment Manager (EM), the Ecological Clerk of Works (ECoW), and the Fisheries Liaison Officer (FLO) and a supporting Consents Team as required. Responsibilities of the ECoW are defined further below. The role of the EM and the FLO are outlined in the CEMP (LF000009-CST-OF-PLN-0014) and are not repeated in this CMS.

4.1.10 Seagreen Ecological Clerk of Works (Offshore ECoW)

The ECoW is a key role required by the Seagreen OWF Project consents. Responsibilities of the ECoW in relation to the CMS include:

- Quality assurance of this CMS;
- Providing advice to Seagreen on compliance with the CMS;
- Monitoring compliance with the CMS and associated consent plans;
- Reporting on compliance with the CMS to Seagreen and to MS-LOT;
- Ensuring appropriate training is provided in relation to construction-related environmental measures and consent compliance; and ensuring delivery of toolbox talks as appropriate, in liaison with the Seagreen EM.

4.1.11 Seagreen Fisheries Liaison Officer (FLO)

The FLO will provide liaison with the local fishing industry and will provide them with notification of Seagreen planned works and vessel movements.

4.1.12 Consultant Archaeologist

The consultant archaeologist will provide advice in relation to marine archaeological matters during the works.

4.1.13 Seagreen Main Contractor

Seagreens's main contractors and turbine supplier for the OWF works is yet to be confirmed however, once appointed the main contractors will adhere to the chain of command outlined in Figure 4.1.

4.2 Contact Details

Contact details for key Seagreen personnel, contractors and sub-contractors will be provided to MS-LOT, in line with consent conditions when available and prior to engagement in the works, through the submission of the proforma included in Appendix E.

5. Seagreen construction management framework

5.1 Overview

This section provides an overview of the overarching Seagreen construction management framework within which the Seagreen OWF Project will be delivered. It details the industry guidance available to inform the Seagreen construction management framework, highlights wider obligations under the Construction (Design and Management) Regulations 2015 (CDM regulations) and the Seagreen offshore CEMP, provides details of training and competence requirements before summarising contractor and sub-contractor obligations.

The Seagreen construction management framework will ensure the safe, compliant installation of the Seagreen OWF Project components, as described in this CMS.

5.2 Industry guidance

Industry guidance documents that have been produced to guide good working practices in relation to construction management for offshore wind farms are shown below in Table 5.1. These guidance documents have been used to inform this CMS, where relevant, and Table 5.1 provides a cross-reference to the relevant section of the CMS informed by the industry guidance presented.

Table 5.1: Offshore Wind Farm construction guidance.

Author and publication year	Title	Scope	Cross reference to relevant section in this CMS
Health and safety			
G+/DROPS, published through the Energy Institute, Jun 2019	Reliable securing booklet for offshore wind	Provides information to help eliminate the risk of dropped objects, explaining the requirement for worksite hazard management and illustrates best practice recommendations. Information applies to all personnel, tools, equipment and structures associated with design, supply, transportation, installation, maintenance, operation and dismantlement activities across industry.	All of section 6
The G+, published through the Energy Institute, Jul 2018	Working at height in the offshore wind industry (2nd Ed.)	Describes how to reduce the need for working at height (WAH) and how to make suitable provision and preparation for WAH. Covers design, construction, commissioning, operations, maintenance and decommissioning phases. Gives topic guidance on common requirements for WAH – training, fitness requirements, PPE, responsibilities of those undertaking, supervising and/or procuring work – and common hazards with recommendations on how to reduce risk. Also provides guidance on creating	Section 6.5, 6.6 and section 6.7

Author and publication year	Title	Scope	Cross reference to relevant section in this CMS
		procedure flowcharts, and national/ EU regulations and requirements.	
RenewableUK, Mar 2014	Offshore Wind and Marine Energy H&S Guidelines	Guidelines consider health and safety risks in relation to offshore wind and marine energy projects. Covers project definition and design, construction, commissioning, operations, maintenance and decommissioning phases, including supporting activities to these phases (e.g. survey and geophysical). Covers most significant hazards and activities relevant to offshore wind and marine projects.	All of section 6
RenewableUK, Dec 2013	H&S First Aid Needs Assessment	Guidance on how duty holders can assess provision of adequate and appropriate equipment, facilities and personnel to ensure employees receive proper attention if they are injured or taken ill at work. Sets out key issues to take into account when conducting a first aid needs assessment.	All of section 6
Vessels and equipment			
The G+, published through the Energy Institute, Jan 2018	The safe management of small service vessels used in the offshore wind industry (2nd Ed.)	Addresses small service vessels of less than 500GT, e.g. crew transfer vessels, guard vessels, survey vessels and construction support vessels. Applicable to all offshore wind farms globally; consistent with national requirements. Covers responsibilities for parties involved in management of service vessels, audit and inspection of wind farm service vessels, operating procedures for marine operations and vessel activities, management of vessel traffic, training and competence of crew and passengers, and vessel safety equipment.	Sections 4, 5 and 6
RenewableUK, 2015	Vessel Safety Guide	Guidance in the process of selection and management of vessels and interface of equipment to ensure all are Fit for Purpose and operated within a robust Health and Safety management system.	Sections 5 and 6
The Crown Estate, Sep 2014	Construction vessel guideline for the offshore renewables industry	Provides guidance to developers and supply chain for the construction of a UK offshore wind farm project. Follows on from '*Vessel Safety Guide – Guidance for offshore renewable energy developers (Vessel Safety Guide)*' published by RenewableUK in 2012.	Sections 5 and 6
RenewableUK, Nov 2013	Guidelines for Selection and	Guidelines for good industry practice to be followed for selection and operation of jack-ups. Relevant to jack up	Sections 5 and 6

Author and publication year	Title	Scope	Cross reference to relevant section in this CMS
	Operation of Jack-ups in Marine Renewable Energy Industry	owners/ operator's technical staff and crews responsible for the operation of jack-ups, and to project managers in the offshore renewables energy industry.	
Communication with other sea users			
Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) / The Crown Estate, Jan 2014	FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison	Provides information to allow offshore renewables developers and the fishing industry to liaise on potential impacts and/ or interactions in regard to the planning, construction and operation of offshore renewables projects.	Sections 4 and 6.2
RenewableUK, Dec 2013	Safety Circular: Notices to Mariners. Guidance for Offshore Wind & Marine Projects	Guidance on accepted scope and format for issuing Notices to Mariners (NtoM).	Section 6.2

5.3 Construction (Design and Management) Regulations 2015 (CDM regulations)

The Seagreen OWF Project is a notifiable project for the purposes of the Construction (Design and Management) Regulations 2015 (CDM regulations). The aim of the CDM regulations is to improve health and safety for all personnel and roles in the construction sector.

Seagreen will require compliance with the CDM regulations in the design and construction of the Seagreen OWF Project and will require that all personnel involved in the construction process follow the company SHE standards and risk management procedures. All contractors and sub-contractors will be expected to comply with Seagreen Employer SHE Requirements (see LF000009-HSE-MA-STD-0001).

5.4 Environmental management

The environmental management procedures which will be followed during the construction of the Seagreen OWF Project are set out in full in a number of associated consent plans, in particular the offshore CEMP (LF000009-CST-OF-PLN-0014).

5.5 Training and competence

Seagreen will require that all personnel engaged in the construction of the Seagreen OWF Project have adequate relevant experience and training, in order to safely perform the duties that are required of them within their remit. Seagreen will require that all employed personnel are adequately supported at all levels.

Where training or certification is required to perform duties under a role, Seagreen will require that relevant certification and training records are made available for inspection where necessary.

Contractors will provide appropriate training and certification of training and will require sub-contractors adhere to the Seagreen requirements in regard to training and competence through conditions of contract.

Seagreen personnel, contractors and sub-contractors will undergo site inductions prior to commencing work on site and will be required to attend regular toolbox talks on relevant topics where an update or specific sensitivity has been identified.

5.6 Contractor and sub-contractor obligations

Seagreen requires contractors and sub-contractors, in undertaking the construction of the Seagreen OWF Project, to comply with all relevant environmental and maritime legislation and that all necessary licences and permissions are obtained by the contractors and their sub-contractors, through conditions of contract. Seagreen therefore requires that embedded design measures and good working practices (see Section 6.2) are applied throughout the construction phase (see the Offshore CEMP - LF000009-CST-OF-PLN-0014).

The Contractor's Construction Environmental Advisors (CEAs), appointed by each contractor, will ensure implementation of construction management framework measures throughout the duration of the construction period. All contractors and sub-contractors will ensure compliance with the Seagreen Employer SHE Requirements (see LF000009-HSE-MA-STD-0001).

6. Construction procedures, mitigation and good working practices

6.1 Overview

This section presents the construction methods and procedures for each component of the Seagreen OWF Project. The construction process for the Seagreen OWF Project is comprised of seven broad stages, which are summarised in Figure 6.1. Each individual stage is described separately in sections 6.4 to 6.9.

Table 6.1 below outlines the major construction milestones for each stage of the Seagreen OWF Project. Details of the construction programme for the works described in this CMS are provided in the Construction Programme ("CoP") (LF000009-CST-OF-PRG-0002). It is currently anticipated that the offshore construction works will be carried out year-round and around the clock (i.e. 24 hours working, 7 days a week).

Table 6.1: Key construction milestone for the installation of the Seagreen OWF project [1].

Indicative Date	Milestone
Q2 2021	Commencement of Construction under S36 consent.
Q2 2021	Stage 1: Seabed Preparation
Q3 2021 & Q2/3 2022	Stage 2 & 3: WTG Jacket Suction Bucket Substructure Assembly and Installation
Q2 2023 – Q3 2023	Stage 4: WTG Piled Foundation Substructure Assembly and Installation
Q3/Q4 2021 & Q2/Q3 2022 & Q3 2030	Stage 5: Inter-array Cable Installation
Q3 2021 – Q4 2022	Stage 6: WTG Installation
Q4 2023	Stage 7: Commissioning

[1] Note: With reference to the Construction Programme Consent Plan (LF000009-CST-OF-PRG-0002), there may be a time gap between the installation of the WTGs on suction bucket foundations and the WTGs on jackets with piled foundations. During this gap, certain WTGs on suction buckets may be commissioned and begin generating. The installation of the second OSP may not be sequential as outlined above but regardless, the process followed will be as set out in the relevant Section .

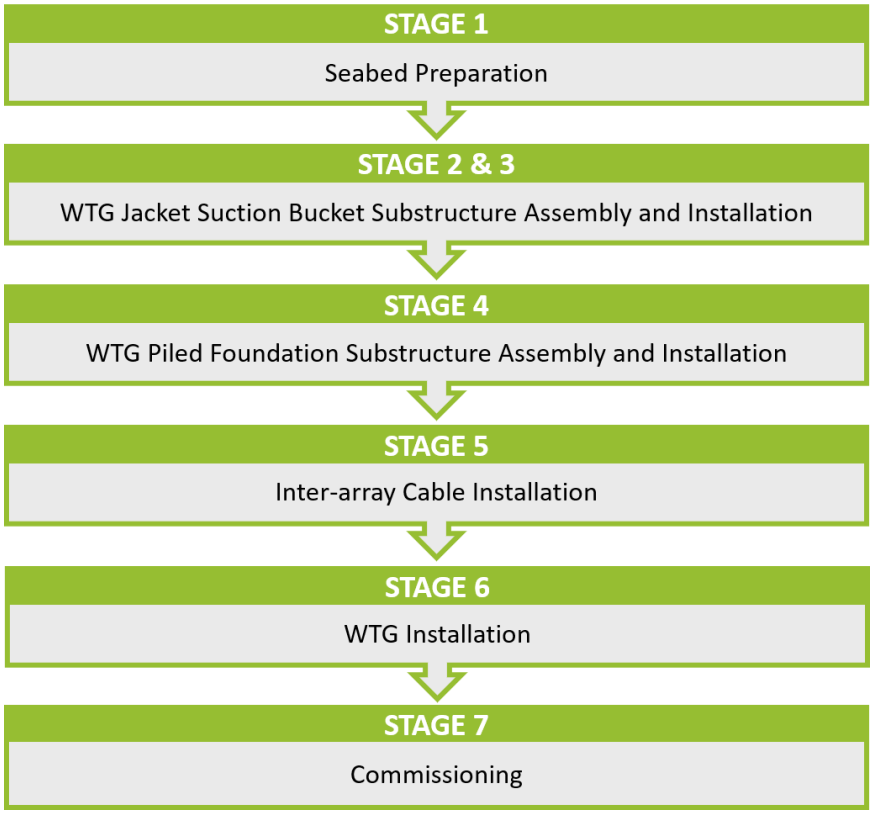


Figure 6.1: Overview of construction sequence.

6.2 Mitigation and Good Working Practices

The overarching mitigation measures and good working practices, as committed to in the ES and ES Addendum and which will be applied to all stages of the Seagreen OWF Project installation, are set out in Appendix D - Summary of mitigation commitments.

A complete register of the mitigation, management, and monitoring commitments made in the ES and ES Addendum, are set out in the commitments register, included as part of the Offshore CEMP (LF000009-CST-OF-PLN-0014).

For the purposes of this CMS, good working practice is taken to mean the following:

- Managing the construction process to reduce the potential for harm to construction personnel or third parties; and
- Reducing potential effects on the environment and other users of the marine environment are minimised as far as reasonably practicable in line with the commitments made in the ES and the ES Addendum.

6.3 Construction Ports and Marine Coordination Centre

This section presents the proposed arrangements for the construction ports and Marine Coordination Centre (MCC) which will support the Seagreen OWF Project construction and operational phase activities.

Montrose, Able Seaton and Vlissingen (NL) will be used as construction ports for the Seagreen Project. In addition, a number of other ports may also be utilised but these cannot be confirmed at this time. The MCC will be based at Montrose Harbour. The MCC facility will be used during both the construction and operational phases of the Seagreen OWF Project.

6.4 Stage 1: Seabed preparation

6.4.1 Introduction

Seabed preparation activities will be required in advance of foundation installation and inter-array cable installation activities to remove any boulders or debris from the seabed. Detailed analysis of ground conditions at the Seagreen OWF Project site has identified distinct areas where there is potential for boulder presence, however it has been confirmed that boulder density does not warrant the use of ploughs to remove boulders. Boulders have the potential to disrupt foundation installation operations and inhibit inter-array cable burial. These activities may require further licensing. If a licence is required, this will be applied for by Seagreen under the Marine (Scotland) Act 2010 for activities within 12 NM of the coast and under the Marine and Coastal Access Act 2009 for activities beyond 12 NM. The sequence of events and indicative durations for seabed preparation to remove low density boulders is illustrated in Figure 6.2.

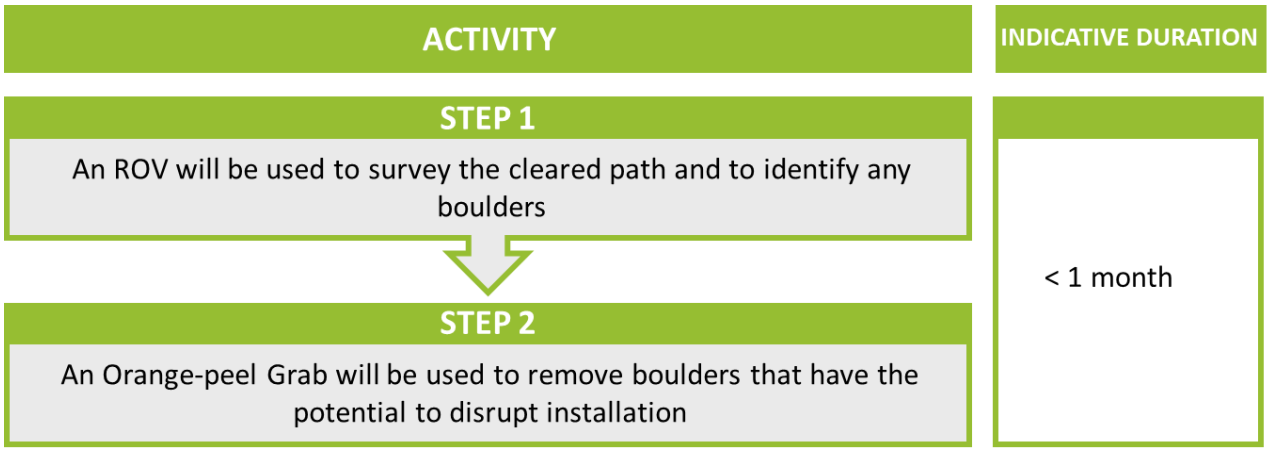


Figure 6.2: Overview of WTG and inter-array cable route seabed preparation activities.

6.4.2 Key equipment and methodology

The key equipment and methodology for seabed preparation activities is presented in Table 6.2. Delivery of equipment will be directly to the OWF site from the port or a previous operational location, and will be by sea transport. All equipment will be launched from a Platform Supply Vessel (PSV) or equivalent.

Table 6.2: Key equipment and methodology – seabed preparation.

Equipment	Methodology
Step 1: Boulder survey with ROV	
ROV:  Source: https://www.rovco.com/services/rov/	• The ROV will survey the cleared path to identify any boulders.
Step 2: Final boulder clearance with Orange-peel Grab	
Orange-peel Grab:  Source: http://www.fisheroffshore.com/equipment/subsea-tooling/recovery/boulder-grabs/	• May be deployed from PSV or similar vessel. • Deployment of orange-peel grab to relocate boulders (if necessary).

6.4.3 Mitigation and good working practices

Full details of all mitigation measures and good working practices which will be applied to all stages of the Seagreen OWF Project installation are set out in Appendix D - Summary of mitigation commitments, Table D.1.

6.5 Stage 2 & Stage 3 – WTG jacket suction bucket substructure assembly & installation

6.5.1 Introduction

The project includes 114 WTG foundations placed upon suction bucket caissons. Each suction bucket foundation structure will comprise the suction bucket caissons, the jacket structure and the jacket transition piece. An overview of the foundation installation process and indicative durations is shown in Figure . The foundations will be assembled onshore at the Jacket Assembly Port (JAP) before being transported to the Seagreen OWF Project area.

Scour protection may be required at the base of the installed suction bucket caissons to mitigate the effects of wave, tide and seabed surface movement. This ensures that a tight seal is maintained between the bottom of the suction bucket caissons and the seabed thus maintaining the integrity of the substructure.

Where scour protection is required, this will be achieved by rock placement around the foundation and the base of the substructures after installation. Rock placement will infill any scour pit which may have developed post-installation and will create a rock berm above seabed level. This will be designed to remain stable for the lifetime of the structure under all forms of predicted environmental loading. The rock placement will be achieved using a fall pipe vessel.

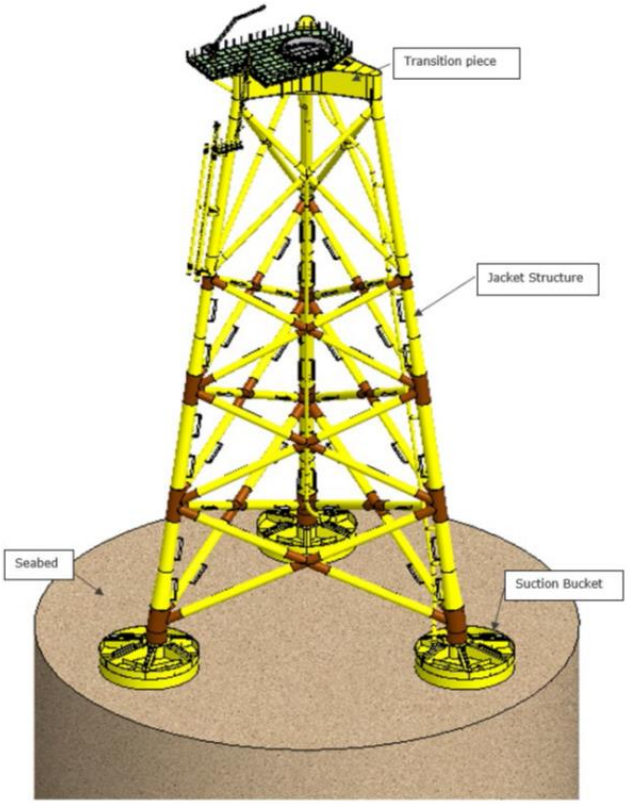


Figure 6.3: Fully assembled jacket substructure.

Figure 6.4: Overview of foundation installation and scour protection activities.

6.5.2 Key Parameters and Methodology

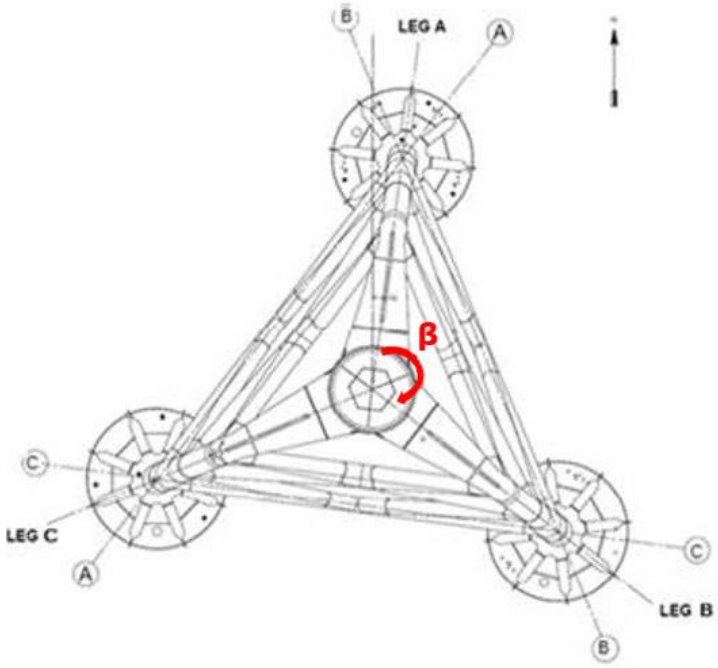
Key components and parameters associated with the foundation design are set out in Table 6.3 and Table 6.4 respectively, with the installation methodology and equipment outlined in Table 6.5.

It should be noted that at this stage the need for scour protection is still to be confirmed, and shall be confirmed in due course upon analysis of in-place geotechnical parameters. The need for scour protection will be confirmed at a later date and the amount of protection that is constructed will be within the envelope of the parameters assessed within the ES and ES Addendum.

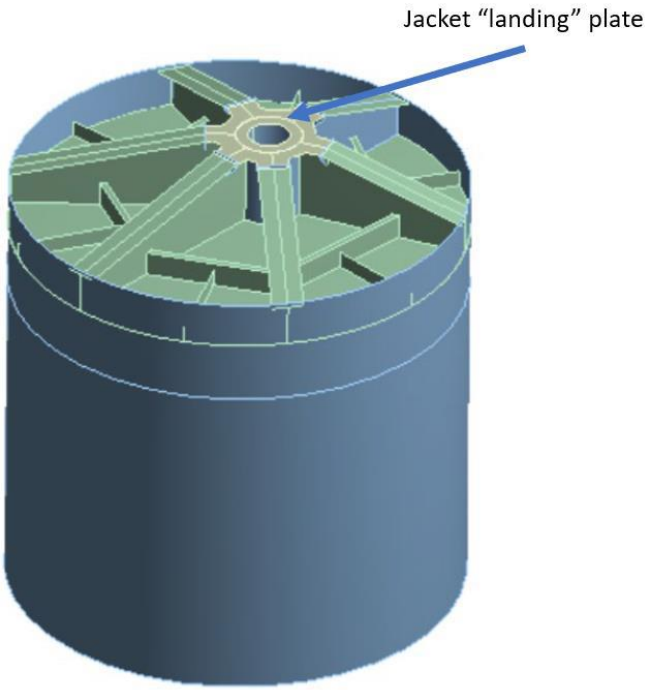
Table 6.3: Key components – suction bucket jacket foundations.

Component	Purpose	Quantity
Jacket (Up to 4-legged (tripod) jacket constructed of steel) (see Figure 6.3).	To form the foundation support and platform for the WTGs. Includes associated working platforms, access ladders and boat landing.	150 (114 jackets secured via suction bucket caissons, 36 jackets secured by pin piles, (see Stage 4: WTG piled foundation substructure assembly and installation)
Suction bucket caissons (see Figure 6.3)	Secures the jacket to the seabed.	Up to 342 (3 per WTG jacket)

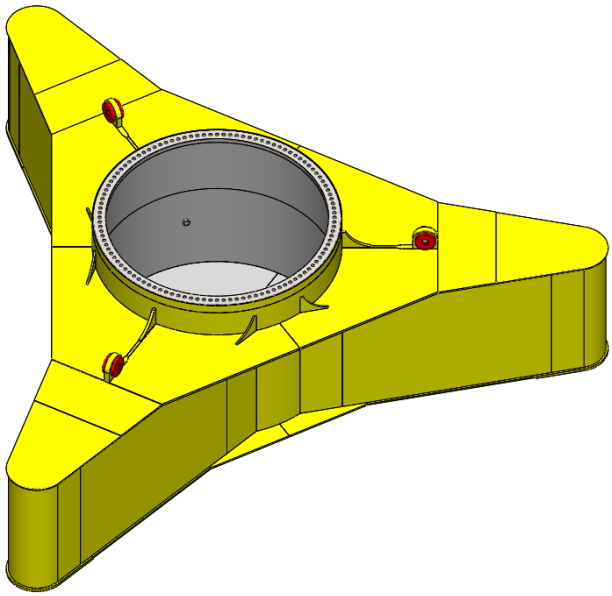
Component	Purpose	Quantity
Jacket Transition Piece (TP) (see Figure 6.3).	Forms the connection between the main jacket structure and the WTG tower. Includes associated working platforms and access ladders.	150
J-tube and associated bellmouth	For connection and protection of inter-array cable.	300 (114 jackets secured via suction bucket caissons, 36 jackets secured by pin piles, two J-tubes per foundation) see Stage 4: WTG piled foundation substructure assembly and installation)



Schematic 6.1: Plan view of jacket substructure schematic showing 3-legged tripod structure (Seagreen Wind Energy Ltd, 2019).



Schematic 6.2: Jacket leg to suction bucket caisson connection (Seagreen Wind Energy Ltd, 2019).



Schematic 6.3: Overview of Transition Piece (TP) (Seagreen Wind Energy Ltd, 2019).

Table 6.4: Key parameters – suction bucket jacket foundations.

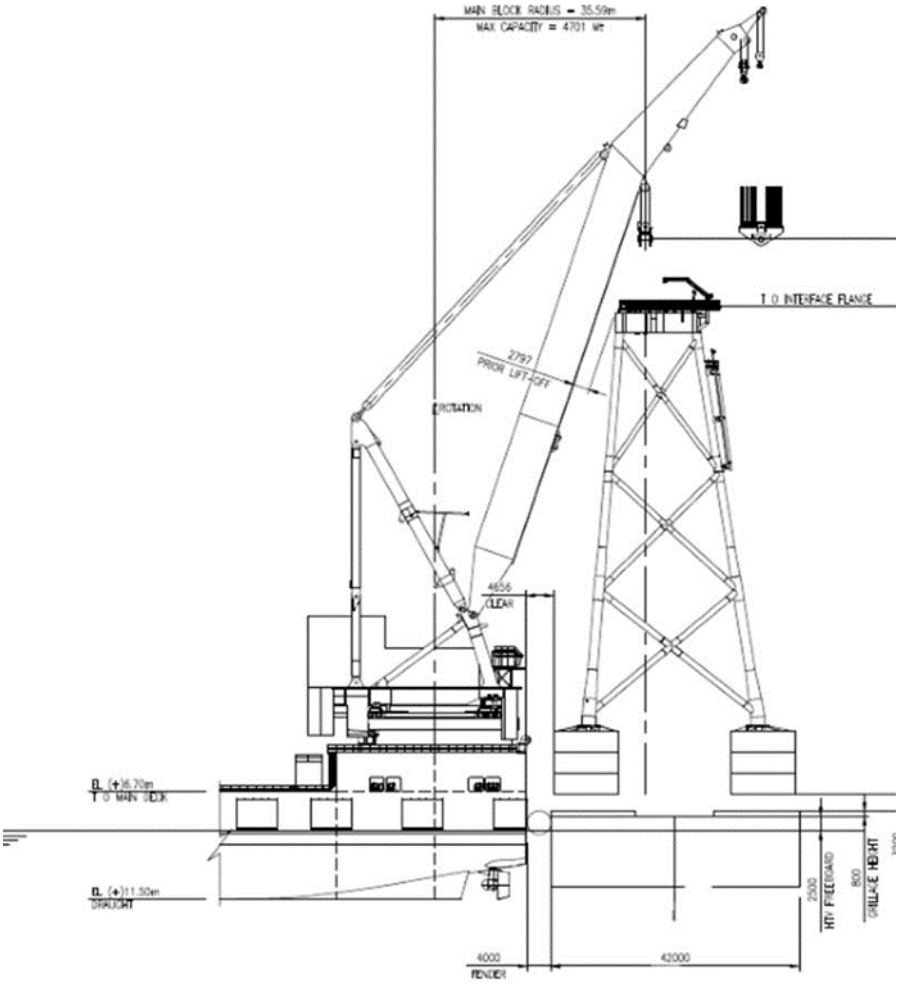
Parameter	Indicative Value
Jacket dimensions and weight	
Jacket maximum height (individual) including Suction Buckets	95 m
Jacket maximum weight (individual) including Suction Buckets	1,900 t
Suction bucket dimensions	
Suction bucket (individual) maximum diameter	10.5 m – 11.5 m
Suction bucket (individual) maximum height	10.5 m
Suction bucket (individual) maximum weight	210 t – 250 t

Table 6.5: Installation methodology – WTG jacket suction bucket caisson foundations.

Equipment/Vessels	Methodology
Step 1: Substructures (up to 5) loaded onto transport vessel and transported to Seagreen OWF Project site	
Heavy Transport Vessel (HTV) / installation vessel:  Source: http://www.fugro.com	Jackets delivered to site by HTV / installation vessel (up to five structures simultaneously).
Step 2: Substructure lifted from transport vessel and lowered to seabed (see Schematic 6.4)	
Mounted armhoist crane:  Source: saipem.com	Substructures are lifted and lowered to the seabed by Installation Vessel.
Step 3: Substructure secured to sea floor	

Equipment/Vessels	Methodology
Mounted armhoist crane (see Step 2) Suction pumps	Each of the jacket suction bucket caissons are secured to the seabed in a two-part procedure: 1. Self-weight penetration: Once touch-down has been achieved, crane load is reduced in a controlled manner, allowing slow penetration of suction bucket caisson into the seabed, under the self-weight of the substructure (sufficient to create an adequate seal between the caisson and seabed so that suction-assisted penetration can proceed). During self-weight penetration the suction bucket caisson will be vented to allow free escape of water; and 2. Suction-assisted penetration: Once self-weight penetration is complete, vents in the caisson are closed.
Step 4: Grouting	
Pumps and grout (cement) mounted on a Grouting Support Vessel (GSV)  Source: Marine Traffic	Grout will be mixed using fresh water on board the installation vessel and stored in grout silos ready for use. Grout is pumped into the cavity between the seabed and the top of the suction bucket. The grout cures and hardens.
Stage 5: Scour protection installation	
Fall pipe vessel:  Source: Marine Traffic ROV: (See Table 6.2)	Scour protection installed using a fall pipe. An ROV positioned at the end of the pipe is used to adjust the delivery point relative to the vessel. The ROV is used to survey the position and shape of the scour protection.
Step 6: Survey	
ROV (see Table 6.2)	Following installation, the foundation area and the base of the structure will be resurveyed to confirm that the required coverage and rock profile has been achieved.

Equipment/Vessels	Methodology
Step 7: Completion and move out of HLV and Grouting Support Vessel	
HTV / installation vessel (see Step 1) GSV (see Step 4)	The HTV / installation vessel and GSV will both mobilise and relocate to the next WTG location.



Schematic 6.4 showing lift from HTV into vertical position.

6.5.3 Mitigation and good working practices

Full details of all mitigation measures and good working practices which will be applied to all stages of the Seagreen OWF Project installation are set out in Appendix D - Summary of mitigation commitments., Table D.1.

6.6 Stage 4: WTG piled foundation substructure assembly and installation

6.6.1 Introduction

The project includes 36 WTGs supported by piled jacket foundations. Delivery of main components will be directly to the OWF site by sea transport from the location of fabrication. The sequence of events and indicative durations for WTG piled foundation substructure assembly and installation is illustrated in Figure 6.5

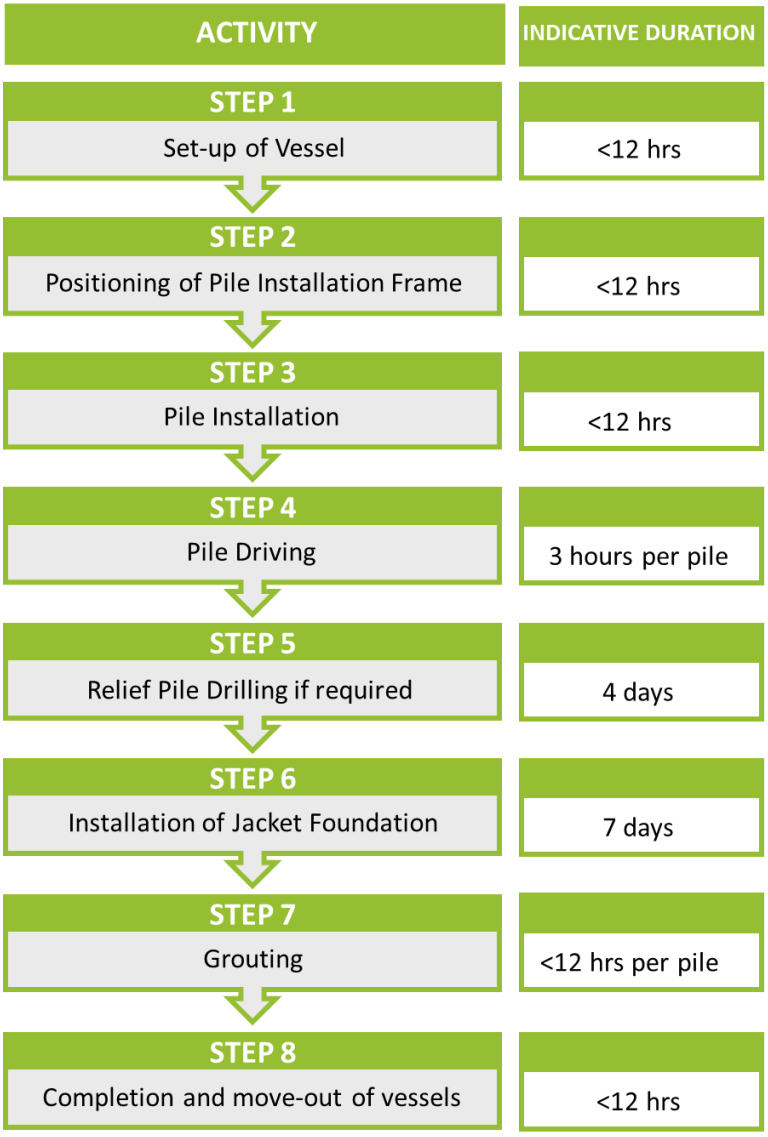


Figure 6.5: Overview of WTG piled foundation substructure assembly and installation.

6.6.2 Key parameters and methodology

Key parameters associated with the piled WTG foundation design are set out in Table 6.6, with the installation methodology and equipment outlined in Table 6.7. Details of the jacket structure have previously been described in Section 6.5 and are not repeated here. Mitigation and good working practice

measures specific to WTG piled foundation installation are set out in Appendix D - Summary of mitigation commitments., Table D.1. and in the OWF PS (LF000009-CST-OF-PLN-0022).

It should be noted that at this stage the need for scour protection is still to be confirmed and shall be confirmed in due course upon analysis of in-place geotechnical parameters.and the amount of protection that is constructed will be within the envelope of the parameters assessed within the ES and ES Addendum.

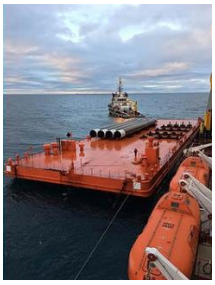
Table 6.6: Key parameters – WTG piled foundation substructure assembly and installation.

Parameter	Indicative Value
No of jacket foundations	36
Piles per jacket	Up to 4 (144 in total)
Footprint on seabed (pile centre to pile centre)	40 m x 40 m

Table 6.7: Installation methodology – WTG piled foundation substructure.

Equipment/Vessels	Methodology
Step 1: Set-up of vessel	
Heavy Lift Vessel (HLV):  Source: Marine Traffic	Jacket delivered to site by HLV. Vessel arrives at proposed foundation installation location and positions ready for operations.
Step 2: Positioning of pile installation frame	
Jacket and transition piece – HTV / installation vessel:  Source: http://www.fugro.com Pile Installation Frame (PIF) (footprint approx. 32 m x 32 m and weight approx. 400 tonnes)	A pile installation frame (PIF) will be used to install pin piles. PIF is lifted onto the seabed.

Equipment/Vessels	Methodology
 Source: beatricewind.com	
Step 3: Pile Installation	
HLV (see Step 1) PIF (see Step 2)	Piles delivered to HLV by cargo barge which will moor alongside the HLV. Piles are transferred by crane to the HLV. Cargo barge departs. Each pile is lifted into the PIF ready for pile driving operations to commence.
Step 4: Pile Driving	
Piling Hammer:  Source: ihciqip.com Specialist dredging tool (to remove soil plugs) High-pressure water jet Air lift equipment	The piling hammer is lifted onto the pile to be driven. The piles are driven into the seabed to the desired depth. The soil plug (soil beneath piles) is removed to allow jacket installation ('stab-in') to required length using either specialist dredging tool where non-cohesive soils are present, or high-pressure water jet and air lift where cohesive soils are present. The soil plug will be deposited back onto the adjacent seabed. With respect to the deposit of a potential soil plug (pile arisings) onto the seabed during pile installation, the volume of this material would be in the region of 42,192 m^3 (approximately 293 m^3/pile) . PIF recovered to HLV.
Step 5: Relief Pile Drilling (if required)	
Reverse circulation drilling unit (subsea drilling tool):	Where the required pile penetration depth is not achieved, relief drilling may be required. The piling hammer is withdrawn and a reverse circulation drilling unit deployed.

Equipment/Vessels	Methodology
 Source: tms-supplies.nl	A subsea drilling tool is lowered from the HLV onto the pile. Material inside the pile is drilled out with removed material deposited on the adjacent seabed. The number of piles requiring relief drilling is not currently quantifiable but will be estimated through the pile driving assessments performed during the ongoing engineering design work Drilling continues until required depth is achieved or obstruction is passed. Piling driving may resume. Drill rig is removed and recovered to the HLV.
Step 6: Installation of Jacket Foundation	
Steel brushes High-pressure water jets HLV (see Step 1) Towed barge:  Source: beatricewind.com	Jacket foundation substructure delivered to site by towed barge or HLV. Towed barge moors alongside HLV. HLV crane used to lift jacket and lower onto connection between piles and the legs of the jacket.
Step 7: Grouting	
Grouting spread: 	Once the jacket is in place, the connection between the jacket foundation structure and the pile is grouted. Grout will be mixed using fresh water on board the HLV vessel and stored in grout silos ready for use. Grout is pumped into the joint between the jacket and the pile. The grout cures and hardens.
Step 8: Completion and move-out of vessels	
HLV (see Step 1).	The HLV will move to the next piling location (WTG) (i.e. Step 1 is repeated).

6.6.3 Mitigation and good working practices

Full details of all mitigation measures and good working practices which will be applied to all stages of the Seagreen OWF Project installation are set out in Appendix D - Summary of mitigation commitments. The mitigation and good working practices specific to WTG piled foundation substructure assembly and installation are set out in Table D.2.

6.7 Stage 5: Inter-array cable installation

6.7.1 Introduction

Inter-array cables connect the WTGs in a series of arrays or 'strings' and also provide the connection from the WTGs to the OSP. Inter-array cables will be trenched and buried in the seabed, to a target depth of at least 0.5m to provide protection to the cables. This will be carried out by either a subsea jet trenching tool or an engineered rock placement solution where trenching to required depth has not been possible. An overview of the cable installation process and indicative durations is provided in Figure 6.6

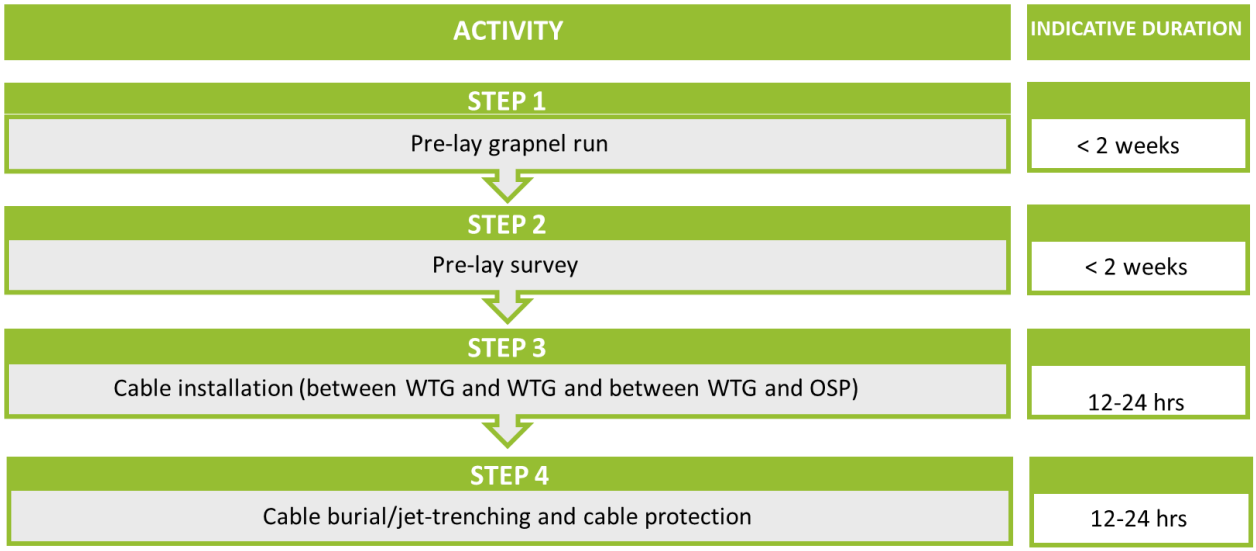


Figure 6.6: Overview of inter-array cable installation process.

6.7.2 Key Parameters and methodology

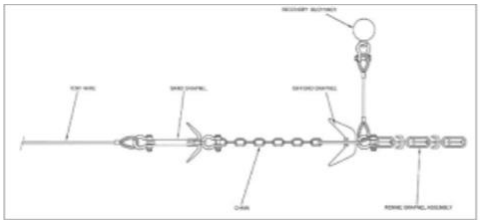
Key parameters for the inter-array cables are set out in Table 6.8 with the installation methodology and equipment set out in Table 6.9.

Mitigation and good working practice measures specific to cable installation are set out in Appendix Table D.1.

Table 6.8: Key parameters – inter-array cables.

Parameter	Indicative Value
Inter-array cables	
Length	Circa 300km of inter-array cables to connect strings of WTGs on suction bucket caissons together and to connect these WTGs to the OSP. Circa 55km of inter array cables to connect strings of WTGs on piled foundations together and to connect these WTGs to the OSP
Burial depth	0.5 m (minimum)
Width of trench	3 m
Width of seabed disturbance	10 m
Cable voltage	66kv
Cable protection	
Material (type)	Rock
Cable protection length x width x height	Up to 35.5 km x 7 m x 1 m in each of Alpha and Bravo (combined total length of up to 71km across Seagreen Project)

Table 6.9: Installation methodology – inter-array cables.

Equipment/Vessels	Methodology
Step 1: Pre-lay grapnel run	
Grapnel assembly:  Source: Sharp Hydrographic Ltd	• The cable route will be cleared of any remaining obstructions by undertaking a pre-lay grapnel run (PLGR) • The PLGR vessel will tow the grapnel rig along the centreline of the cable route with a tolerance of +/- 5 m Any debris encountered will be recovered to the deck of the vessel for appropriate licensed disposal ashore.
Step 2: Pre-lay survey	
ROV:  Source: https://www.rovco.com/services/rov/	• An ROV deployed from the Cable Lay Vessel (CLV) will perform a pre-lay survey immediately prior to the cable installation operation.

Equipment/Vessels	Methodology
CLV:  Source: https://www.vanoord.com/activities/cable-laying-vessel	
Step 3 (1): Cable installation (between WTG and WTG)	
CLV (see Step 2) Installation Support Vessel (ISV):  Source: REnews ROV (see Step 3)	• The CLV is pre-loaded with the inter-array subsea cable. • Cables are surface laid between the WTGs. **First end pull in (to WTG):** • The Cable Protection System (CPS) is fitted to the cable end on board the CLV. • An ROV will recover a pre-installed messenger wire within the J-Tube. The wire will be winched to deck and connected to the CPS. • The CLV will then pay out the cable, which is winched into the WTG. • On completion of the route length, the end of the cable is then cut, sealed and prepared for second end installation operations.
Subsea quadrant  Source: http://www.subenesol.co.uk/Rental/Offshore-Wind-Farm-Cable-Lifting-Quadrant	**Second end pull in (to WTG or OSP):** • The CPS is fitted to the cut and sealed cable end on board the CLV. • An ROV will recover a pre-installed messenger wire within the second WTG or OSP J-Tube. The wire will be winched to deck and connected to the CPS. The cable and subsea quadrant are lowered overboard. • The cable is fed through the J-Tube and into the WTG or OSP. The subsea quadrant is lowered as the cable is pulled in to the WTG or OSP. Finally, the quadrant is tilted in order that the cable is laid to the seabed. The quadrant is retrieved, and final bight of cable is pulled in to the WTG or OSP. • Cable testing will be performed at various stages during the cable lay operations. • The process is then repeated for the remaining inter-array cable lengths, connecting WTGs together in 'strings' and those strings of WTGs to the OSP.
Step 3 (2): Cable installation (between WTG and OSP, where different from WTG to WTG methodology)	
	• All OSP pull-ins will be performed as "first end pull-ins" as the OSP location is a congested area due to multiple cable approaches.

Equipment/Vessels	Methodology
Step 4: Cable burial/jet-trenching and cable protection	
Seabed trenching tool:  Source: http://www.helixesg.com/ Water jetting, seabed trenching vehicle:  Source: http://www.nsri.co.uk/ Jet trenching and chain cutting hybrid tool  Source: https://www.smd.co.uk/our-products/qtrenchers/qtrencher-1400/ Fall pipe vessel for installation of any rock protection  Source: Marine Traffic	• The inter-array cables are trenched into the seabed to the target depth by a dedicated seabed trenching tool. It is anticipated that cable burial will be primarily achieved by the use of a water jetting, seabed trenching vehicle. • Where jet-trenching is not possible due to the presence of stiff sediments, a hybrid tool capable of both chain cutting and jet trenching will be used. • If target depth has not been reached, a second trenching pass will be completed to ensure the cable is adequately buried. • An engineered cable protection solution will further protect any areas of cable not trenched to the required depth (armouring, concrete mattressing, or rock placement). • Rock protection is usually deposited by a fall pipe vessel.

6.7.3 Mitigation and good working practices

Full details of all mitigation measures and good working practices which will be applied to all stages of the Seagreen OWF Project installation are set out in Appendix D - Summary of mitigation commitments, Table

D.1. The mitigation and good working practices specific to inter-array cable installation, and as identified in the ES and ES Addendum are set out in Appendix D - Summary of mitigation commitments, Table D.3.

6.8 Stage 6: Wind Turbine Generator (WTG) installation

6.8.1 Introduction

This section covers the loading, transport and installation of components which form the WTGs. Major components include the tower, which is installed on top of the jacket foundation, the nacelle, which supports the rotor, and the three individual blades which form the rotor (see Figure 6.7). All components will be loaded onto the installation vessel and transported by sea to the Seagreen OWF Project site. It is envisaged a maximum of five WTGs (and associated tools) can be transported at any one time however there is a possibility this may increase. An overview of the installation process is provided in Figure 6.8

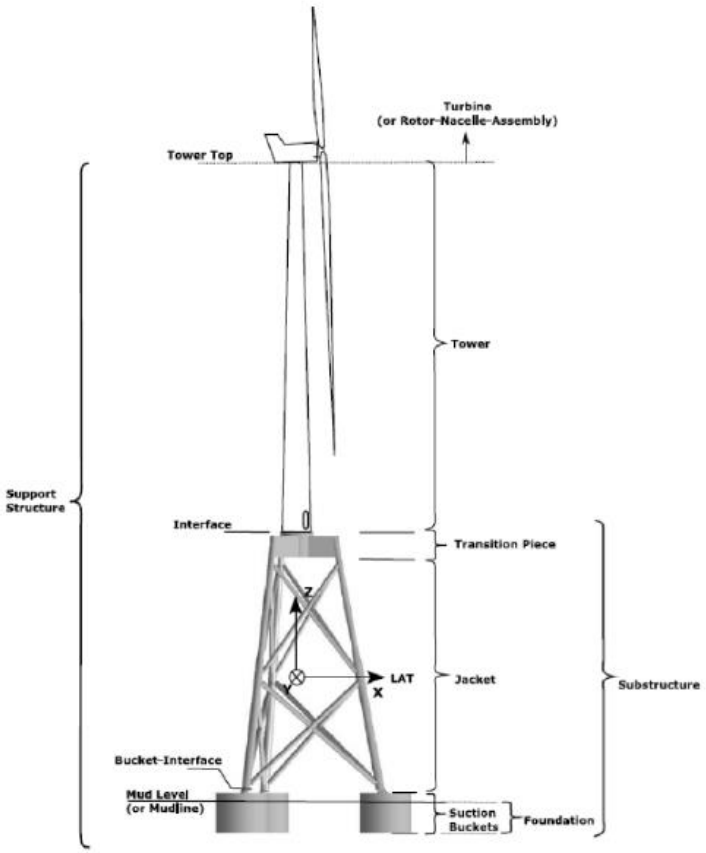


Figure 6.7: Fully assembled WTG and with suction bucket jacket substructure.

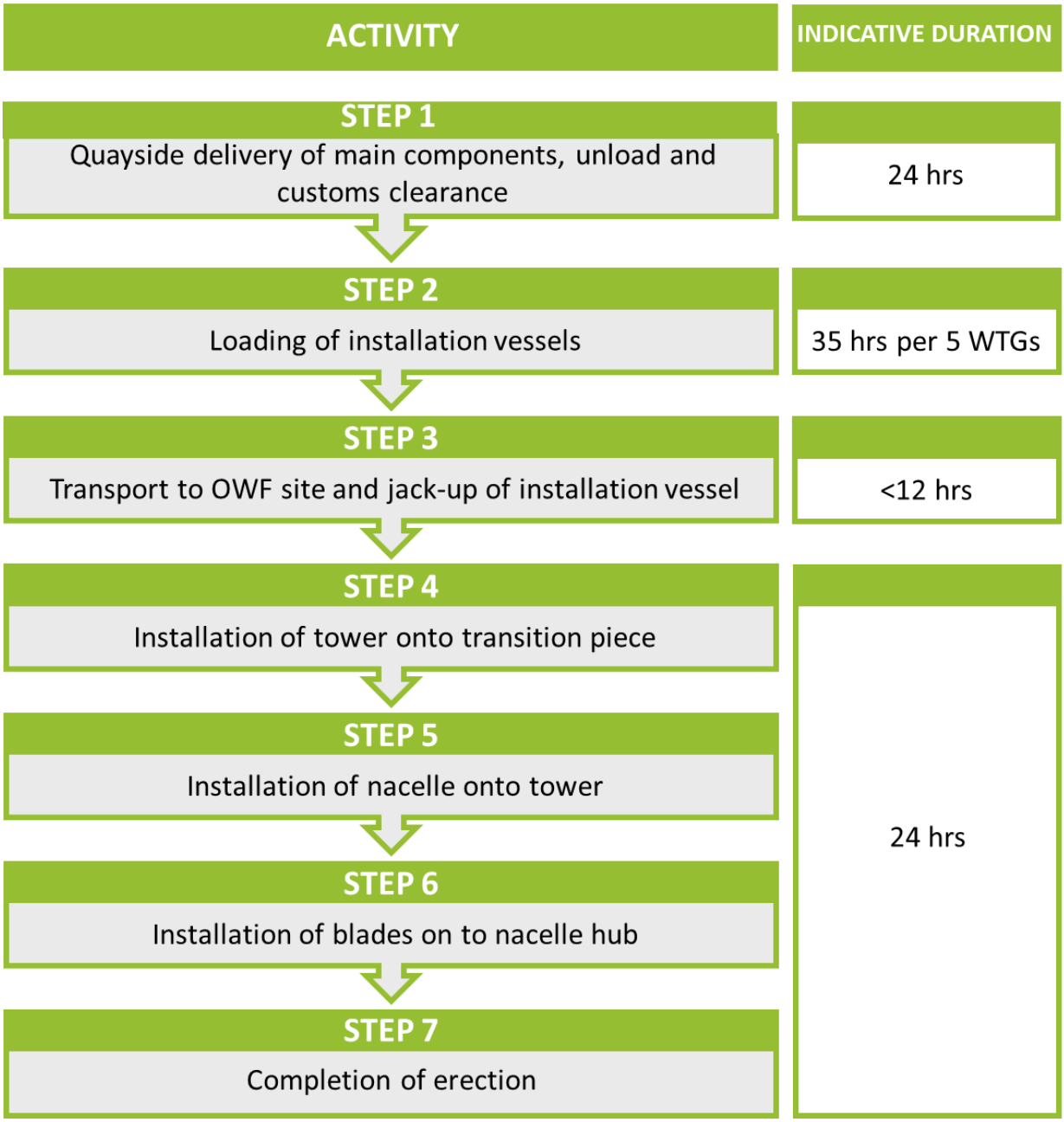


Figure 6.8: Overview of WTG installation activities.

6.8.2 Key parameters and methodology

Key parameters of the WTG components are set out in Table 6.10 with the installation methodology and equipment set out in Table 6.11

Table 6.10: Key parameters – WTGs.

Component	Key parameters
Blades	Number of blades: 450 (3 per WTG)

Component	Key parameters
	Blade length: 80 m Rotor Diameter: 164 m Blade clearance above water level (Lowest Astronomical Tide (LAT)): 37 m to 41m
Nacelle	Number of nacelles: 150 (1 per WTG)
Towers	Number of towers: 150 (1 per WTG) Hub height: 119 to 123 m LAT Total tower height: 93 m
Assembled WTG	Tip height: 201 – 205 m LAT Minimum spacing between WTGs 1,042 m (prior to micrositing)

Table 6.11: Installation methodology – WTGs.

Equipment/Vessels	Methodology
Step 1: Quayside delivery of main components	
Blade mover or self-propelled modular trailer (SPMT)  Source: https://www.khl.com/	• Main components delivered to quayside by blade mover or self-propelled modular trailer (SPMT).
Step 2: Loading of installation vessels	
Installation vessel – Jack-up vessel:  Source: swireblueocean.com/en/media-room/photos/	• Components, equipment and tools are loaded onto installation vessels, and fastened to ensure secure transit to site. • Blades are stacked in a blade rack system. • Nacelle with hub is supported by a transport frame.
Step 3: Transport to OWF site and jack-up of installation vessel	

Equipment/Vessels	Methodology
Installation vessel – Jack-up vessel (see Step 2) Sea transport frame:  Source: https://liftra.com/	• The installation vessel will transport 5 sets of WTG components per round trip and associated equipment. • The installation vessel will jack-up at the WTG foundation location and a safe access platform/ gangway will be installed from the vessel to the foundation transition piece.
Step 4: Installation of tower onto transition piece	
Installation vessel - Jack-up vessel (see Step 2)	• Tower lifted on to the transition piece and secured.
Step 5: Installation of nacelle onto tower	
Nacelle lifting yolk:  Source: https://fk-wind.dk/ Jack-up vessel (see Step 2)	• The nacelle is lifted and positioned onto the tower, bolted and secured.
Step 6: Installation of blades on to nacelle hub	
Single blade installation yoke:	• Each blade is lifted and installed individually. • The nacelle hub is rotated and positioned so that each blade can be installed at a horizontal angle. • Blades are lifted from the installation vessel to the WTG. • Once blade is positioned adjacent to the blade bearing it is secured and the blade yoke is released and detached.

Equipment/Vessels	Methodology
 Source: http://trends.directindustry.com/ Jack up vessel (see Step 2)	
Step 7: Completion of erection	
Installation vessel – Jack-up vessel (see Step 2)	• Once the WTG has been installed, the installation vessel will jack-down and move to the next foundation, where the same installation process will be followed. • When all WTGs on board the vessel have been installed, the installation vessel will return to reload with other WTGs and the installation process will be repeated.

6.8.3 Mitigation and good working practices

The mitigation and good working practices specific to WTG installation, and as identified in the ES and ES Addendum are set out in Appendix D - Summary of mitigation commitments, Table D.1.

6.9 Stage 7: Commissioning

6.9.1 Introduction

Following construction of the Seagreen OWF Project, the project will undergo energisation, reliability testing and take-over certification. Commissioning will be undertaken by completing the following milestones:

- Mechanical commissioning,
- High Voltage (HV) terminations;
- Electrical commissioning; and

- Commissioning completion.

These steps complete the commissioning phase of the Seagreen OWF Project which is the handover of the project from the construction phase to the operation phase

6.9.2 Mitigation and Good Working Practices

The following mitigation and good working practice measures, as identified in the ES and ES Addendum will be implemented during commissioning:

- All commissioning activities will be subject to an approved safe system of work, including the WTG performance and reliability testing and compliance with the Grid code standard (source: ES 5.198); and
- The commissioning of Project Alpha and Project Bravo and the Transmission Asset will be in accordance with approved commissioning procedures. This will be managed by the principal contractor(s) for construction of each project to the requirements of Seagreen and the OFTO, where applicable. Commissioning activities will include the WTGs performance and reliability testing and compliance with the Grid code standard.

7. Compliance with the ES and ES Addendum

The relevant conditions of the S36 Consent require that the Seagreen OWF is constructed in accordance with the construction methods assessed in the ES and ES Addendum and that construction related mitigation proposed in the ES and ES Addendum (which describe the range of methods that could be applied during construction) are delivered.

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 CMS and in other relevant consent plans. To demonstrate compliance with those methods assessed within the ES and ES Addendum, Appendix C provides a tabulated comparison of project construction parameters and methodologies as presented in the ES and ES Addendum with the same parameters that are presented in this CMS.

8. References

Table 8.1 sets out those documents for the Seagreen OWF Project in relation to either consent plans or other reference documents.

Table 8.1 Seagreen document references.

SWEL Document Number	Title
LF000009-CST-OF-PRG-0002	Offshore Construction Programme
LF000009-CST-OF-PLN-0010	Offshore Lighting and Marking Plan
LF000009-CST-OF-PLN-0007	Offshore Navigational Safety Plan
LF000009-CST-OF-PLN-0014	Offshore Construction Environmental Management Plan
LF000009-CST-OF-PLN-0022	Offshore Wind Farm Piling Strategy
LF000009-CST-OF-PRG-0003	Offshore OWFs Environmental Monitoring Programme
LF000009-CST-OF-PLN-0008	Offshore Wind Farm Cable Plan
LF000009-CST-OF-PLN-0006	Offshore Vessel Management Plan
LF000009-HSE-MA-PRO-0008	Incident Reporting Procedure
LF000009-RAM001-REP-H07-003-01	Engineering Report – Scour Protection Strategy Seagreen OWF
LF000009-CON-OM-MAN-0001	Construction and Commissioning Guideline

The Construction (Design and Management) Regulations (2015)
http://www.hse.gov.uk/construction/cdm/2015/index.htm

The Crown Estate (2014) Construction vessel guideline for the offshore renewables industry
https://www.thecrownestate.co.uk/media/373215/construction-vessel-guideline-for-the-offshore-renewables-industry.pdf

The Crown Estate (2014) Sharing lessons learned and good practice in offshore transmission
https://www.offshorewindscotland.org.uk/media/1005/ei-sharing-lessons-learned-and-good-practice-in-offshore-transmission-summary.pdf

The G+ Global Offshore Wind Health and Safety Organisation (2018) Working at height in the offshore wind industry (2nd Ed.), The Energy Institute
https://www.gplusoffshorewind.com/__data/assets/pdf_file/0010/633556/Work-at-Height-Guidelines-2nd-Edition-B31jk-web-version.pdf

The G+ Global Offshore Wind Health and Safety Organisation (2018) The Safe Management of Small Service Vessels Used in the Offshore Wind Industry, 2nd Ed.
https://www.gplusoffshorewind.com/__data/assets/pdf_file/0011/633557/Guidelines-for-the-management-of-service-vessels.pdf

Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) / The Crown Estate (2015) FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries

Liaison https://www.thecrownestate.co.uk/media/1776/floww-best-practice-guidance-disruption-settlements-and-community-funds.pdf

G+/DROPS (2018) Reliable securing booklet for offshore wind https://www.gplusoffshorewind.com/?a=641042

Seagreen Wind Energy Ltd (2019) Marine Installation Package (MIP) Consents and Package General Information

RenewableUK (2015) Vessel Safety Guide https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B-4AB5-96C7-ECF3F0462F75/Vessel_Safety_Guidance.pdf

RenewableUK (2014) Offshore Wind and Marine Energy H&S Guidelines https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B-4AB5-96C7-ECF3F0462F75/Offshore_Marine_HealthSafety_Guidelines.pdf

RenewableUK (2013) Safety Circular: Notices to Mariners. Guidance for Offshore Wind & Marine Projects https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B-4AB5-96C7-ECF3F0462F75/Offshore_Marine_HealthSafety_Guidelines.pdf

RenewableUK (2013) H&S First Aid Needs Assessment https://cdn.ymaws.com/www.renewableuk.com/resource/resmgr/publications/reports/H&S_First_Aid_Needs.pdf

RenewableUK (2013) Guidelines for Selection and Operation of Jack-ups in Marine Renewable Energy Industry Guidelines for Selection and Operation of Jack-ups in Marine Renewable Energy Industry https://cdn.ymaws.com/www.renewableuk.com/resource/resmgr/publications/reports/H&S_Jackup_Barges.pdf

Appendix A – List of abbreviations and definitions

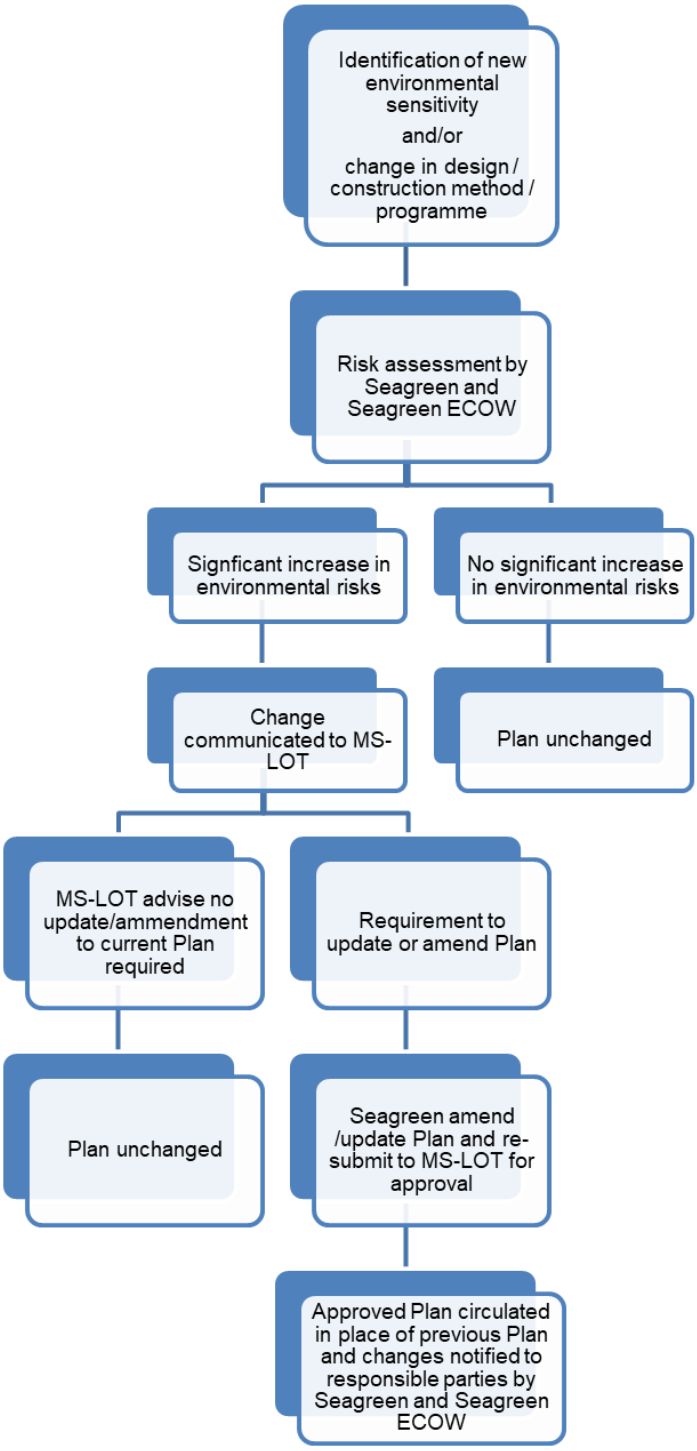
Term	Description
AIS	Automated Identification System
Alpha Marine Licence	Marine licence granted by the Scottish Ministers under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 in respect of Seagreen Alpha Wind Farm on 10 October 2014 as amended by the revised marine licence 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).
Audit	Inspection to confirm, compliance and identify and correct non-conformances
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 Minsters on 12 December 2019 (reference 04677/19/0)
CaP	Cable Plan as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 18
CDM	Construction (Design and Management) Regulations 2015
CEA	SWEL's Contractors are required to appoint a Construction Environmental Advisor (CEA). The Construction Environmental Advisor will be a full-time resource for the duration of the Contractor's construction works and will be dedicated to delivering the requirements of the SWEL consent conditions and wider environmental matters
Offshore CEMP	Construction Environmental Management Plan as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 14
CLV	Cable Lay Vessel
CMS	Construction Method Statement as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 10
COLREGS	International Regulations 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 SWEL
(the) consents	Collective term used to describe the Section 36 consents and Marine Licences issued to SAWEL, SBWEL and SWEL
Contractor	The CONTRACTOR as defined by the CONDITIONS OF CONTRACT
CoP	Construction Programme as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 9
CPS	Cable Protection System

Term	Description
DS	Design Statement Plan as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 13
DSLP	Design Specification and Layout Plan as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 12
ECoW	Ecological Clerk of Works as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 29
EMP	Environmental Management Plan as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 14 (see CEMP above)
ERCoP	Emergency Response Co-operation Plan
ES	Environmental Statement
FLO	Fisheries Liaison Officer (SWEL) as required under Seagreen Alpha and Seagreen Bravo OWFs Section 36 Condition 32
GSV	Grouting Support Vessel
HLV	Heavy Lift Vessel
HTV	Heavy Transport Vessel
IALA	International Association of Lighthouse Authorities
ISV	Installation Support Vessel
JAP	Jacket Assembly Port
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan, required under Condition 19 of the S36 consent
Marine Licence	The Alpha Marine Licence and/or the Bravo Marine Licence
MCA	Maritime and Coastguard Agency
MCC	Marine Coordination Centre
MHWS	Mean High Water Springs
MS-LOT	Marine Scotland Licensing and Operations Team
NLB	Northern Lighthouse Board
NSP	Navigational Safety Plan, as required for approval under Condition 17 of the S36 consent
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
OTA	Offshore Transmission Asset includes the transmission cable required to connect the Wind Farm to the Onshore Transmission Asset. This covers the OSPs and the cable route from the OSPs to the MHWS at the landfall at Carnoustie

Term	Description
OWF	the Wind Farm Assets
PEMP	OWFs Environmental Monitoring Programme as required under Seagreen Alpha and Seagreen Bravo OWFs S36 Condition 26
PIF	Pile Installation Frame
PLGV	Pre-lay Grapnel vessel
PS	Piling Strategy, as required for approval under Condition 11 of the S36 consent
PSV	Platform Supply Vessel
ROV	Remotely Operated Vehicle
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
SAWEL	Seagreen Alpha Wind Energy Limited (company number 07185533) and having its registered office at No. 1 Forbury Place, 43 Forbury Road, Reading, United Kingdom, RG1 3JH
SBWEL	Seagreen Bravo Wind Energy Limited (company number 07185543) and having its registered office at No. 1 Forbury Place, 43 Forbury Road, Reading, United Kingdom, RG1 3JH
Seagreen	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
SHE	Safety, Health, Environment
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 Marine Licence*
SPMT	Self-propelled Modular Trailer
TBC	To Be Confirmed
Toolbox talk	A short presentation given to OWFs team members on an aspect of environmental management
UXO	Unexploded Ordnance
VMP	Vessel Management Plan, required under Condition 15 of the S36 consent
WAH	Working at Height
Wind Farm Assets	Collective term to describe the WTGS, jacket structures, foundations and associated inter array cabling

Term	Description
WTG	Wind turbine generator

Appendix B – The CMS change management procedure



Appendix C - Compliance with the ES parameters and processes

Construction parameter/process	ES/ ES Addendum	CMS
Seabed preparation		
Prior to installation of any type of foundation and substructure, a pre-installation seabed survey will be required to confirm that no obstructions are present. If obstructions are identified the area will be cleared and prepared for the intended installation activity or the foundation may be microsited to avoid obstructions. In addition, there may be a need to microsite the foundations to avoid sensitive ecological or archaeological features that are identified.	ES 5.126	A pre-installation seabed survey will be carried out and if obstructions are identified the area will be cleared and prepared for the intended installation activity (Stage 1: Seabed preparation) Following detailed design, consideration will be given to micro-siting WTGs within the Seagreen OWF Project site (Stage 2 & Stage 3 – WTG jacket suction bucket substructure assembly & installation)
The preferred array cable routes will be surveyed during the pre-construction geophysical survey to locate any obstacles that could obstruct cable laying, such as rocks, wrecks, metal objects or debris and UXO. If an obstruction is located it will be assessed and an appropriate strategy will be established to remove or avoid the obstruction. Where a suspected UXO is identified specialist mitigation will be employed to either avoid or make safe the obstruction.	ES 5.168	A pre-installation seabed survey will be carried out and if obstructions are identified the area will be cleared and prepared for the intended installation activity (Stage 1: Seabed preparation)
Jacket substructure / foundations		
There are three main substructure and foundation options defined within the Rochdale Envelope for supporting the WTG structures. These are: • a four leg steel jacket with driven piles; • a four leg steel jacket with suction piles; and • a Gravity Base System. Other substructure design variants may be considered, including a three leg steel jacket design and a tripod or	ES 5.46 ES 5.47 ES Table 5.1	An up to 4-legged (tripod) jacket constructed of steel (Table 6.). 36 WTGs installed on piled foundation. 114 WTGs installed on suction bucket foundations.

Construction parameter/process	ES/ ES Addendum	CMS
quadropod design supporting a monopole, with driven or suction pile foundations Up to 75 WTGs and supporting structures per project		Total of 150 WTGs (75 per Project Alpha, 75 per Project Bravo)
Primary material: steel	ES Table 5.5	An up to 4-legged (tripod) jacket constructed of steel (Table 6.3)
Foundation suction pile: Upturned bucket style design on each leg of jacket sunk into the seabed using vacuum pumps.	ES Table 5.5	Foundation suction pile: Upturned bucket style design on each leg of jacket sunk into the seabed (Table 6.3)
Suction pile: Max diameter 14 m / Max penetration depth 23 m	ES Table 5.5	Diameter: 10.5m-11.5m (Table 6.4: Key parameters – suction bucket jacket foundations.) Penetration depth: Max 23m
Piling method	ES Tables 13.11 and 13.12	See OWF Piling Strategy: LF000009-CST-OF-PLN-00021)
WTGs		
Up to 150 WTGs and supporting structures	ES 5.11	150 WTGs
Rotor diameter (122 – 167 m)	ES 5.32	164 m (Table 6.10)
Blade chord (4.2 – 5.4 m)	ES 5.32	5.4 m (Table 6.10)
Blade clearance above water level (Lowest Astronomical Tide (LAT)) (26.1 – 42.7 m)	ES 5.32	37 m (Table 6.10)
Hub height (LAT) (87.1 - 126.2)	ES 5.32	119 to 123 m (Table 6.10)
Blade tip height (LAT) (148.1 – 209.7 m)	ES 5.32	201 to 205 m (Table 6.10)
Nacelle Dimensions (Length x Breadth x Height) (15 m x 4 m x 4 m – 24 m x 12 m x 12 m)	ES 5.32	20.6 m x 8.8 m x 9.3 m (including hub) (Table 6.10)
Operating wind speed range (cut-in/ cut-out) (3 m/s – 35 m/s)	ES 5.32	3 m/s - 31 m/s ((Table 6.10)
Rotor swept area (11,690 m^2 – 21,904 m^2)	ES 5.32	21,124 m^2 ((Table 6.10)
Minimum spacing between WTGs – 1000m	ES 5.32	1,042 m (excluding any micro siting) (Table 6.10)

Construction parameter/process	ES/ ES Addendum	CMS
Inter-array Cables		
If trenched, estimated inter-array cable trench width (max): 3 m	ES Table 5.8	3 m
If trenched, cable burial depth: 0.5 – 2.1 m	ES Table 5.8	0.5 m (Table 6.8)
If trenched width of temporary Zone of Influence (sea bed disturbance width) (max): 10 m	ES Table 5.8	10 m
If rock or mattress protected, max height: 1 m	ES Table 5.8	1 m
Array cable voltage: 33 – 66 kV (Alpha) and 33 – 66 kV (Bravo)	ES Table 5.8	66kV
Scour protection		
Foundations - The scour protection will be formed from a combination of a filter layer of stone (<100 millimetre (mm) diameter) and an armour layer of stone (200 - 400mm diameter). Based on 2m thickness at 20m radial extent around a 72m diameter GBS foundation, the maximum area covered per foundation will be 5,780m^2. The maximum volume of scour protection material will be 11,560 m^3 with a weight of 23,120 tonnes.	ES 5.63	To be confirmed, but will be within the max parameters assessed in the ES.
Following installation, the foundation area and the base of the structure will be resurveyed to confirm that the required coverage and rock profile has been achieved.	ES 5.156	Following installation, the foundation area and the base of the structure will be resurveyed to confirm that the required coverage and rock profile has been achieved (section 6.5.1)

Appendix D - Summary of mitigation commitments

Table D.1: Overarching mitigation measures and good working practices as committed to in the ES and ES Addendum associated with types of infrastructure selected

Source	Reference to the relevant section of the ES / other document	Details of commitment	Relevant section of this document
ES September 2012	Project Description – 5.114	A phased programme will be used to reduce safety exclusion areas while construction is in progress.	Section 6.1: Overview
ES September 2012	Project Description - 5.126	Prior to installation of foundations and substructures a pre-installation seabed survey will be required to confirm that no obstructions such as UXO, debris or large boulders are present. Obstructions will be cleared and prepared for the intended installation or the foundation may be micro-sited to avoid obstructions. In addition, there may be a need to microsite the foundations to avoid identified sensitive ecological or archaeological features.	Section 6.4 - Stage 1: Seabed preparation Table 6.2: Key equipment and methodology – seabed preparation
ES September 2012	Project Description – 5.153	The pre-construction geophysical survey will ascertain the level of scour protection required for each location. Scour surveys will continue beyond the construction stage of the project and may form part of the ongoing inspection regime and monitoring for the wind farm projects	Section 6.5 - Stage 2 & Stage 3 – WTG jacket suction bucket substructure assembly & installation Section 6.6 – Stage 4: WTG piled foundation substructure
ES September 2012	Project Description – 5.154, 5.155 and 5.156	If scour protection is required, this will be achieved by rock placement around the foundation and the base of the substructures after installation. Rock placement will infill any scour pit which may have developed after installation and will create a rock berm above seabed level. This will be designed to remain stable for the full lifetime of the structure under all forms of predicted environmental loading. The rock placement will be achieved using a fall pipe	

Source	Reference to the relevant section of the ES / other document	Details of commitment	Relevant section of this document
		vessel or a vessel with a side tipping system. Alternatively, the rock could be placed using a grab device from a suitable vessel.	assembly and installation
ES September 2012	Project Description – 5.199	The commissioning of Project Alpha and Project Bravo and the Transmission Asset Project, will be in accordance with approved commissioning procedures. This will be managed by the principal contractor(s) for construction of each project to the requirements of Seagreen and the OFTO, where applicable. All commissioning activities will be subject to an approved safe system of work, including the Wind Turbine Generators (WTG) performance and reliability testing and compliance with the Grid code standard.	Section 6.9 - Stage 7: Commissioning
ES September 2012	Physical Environment – 7.165, 7.192, 7.204	Up to only two substructures/foundations will be installed simultaneously over any three-day period across all projects during the minimum 6 months annual construction period and therefore the release of this material during construction activities will be phased over time.	Table 6.5: Installation methodology – WTG jacket suction bucket caisson foundations.
ES September 2012	Physical Environment – 7.171, 7.174, 7.215	Substructures/foundations will be installed over a minimum 6 month annual construction period, with no more than two substructures/foundations being installed simultaneously at any one time.	
ES September 2012	Water and Sediment Quality – 8.142	Site specific assessments will be made at each foundation location to determine the preferred foundation type and seabed preparation requirements and methods.	Section 6.4 - Stage 1: Seabed preparation
ES September 2012	Water and Sediment Quality – 8.142	If the need for seabed preparation at any location is determined, a licence will be applied for under the Marine (Scotland) Act 2010 for Dredging and Deposit of Solid Waste in the Territorial Sea and UK Controlled Waters Adjacent to Scotland.	

Source	Reference to the relevant section of the ES / other document	Details of commitment	Relevant section of this document
ES September 2012	Fish and Shellfish Resources – 12.78, 12.354, 12.367	Placement of scour protection should reduce the amount of re-suspended material during operation.	Section 6.5.1 - Introduction
ES September 2012	Marine Mammals – 13.166	Construction is assumed to take place over the full year cycle. The duration of the piling programme for both Project Alpha and Project Bravo will be a maximum of two years, with one piling vessel operating in each Project. Pile driving will not be continuous during this time.	Section 6.6 - Stage 4: WTG piled foundation substructure assembly and installation
ES September 2012	Shipping and Navigation – 15.35, 15.277	The following section presents mitigation measures which can be implemented for the OWF development to reduce the level of impact: • 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 other OWF matters; • the use of guard vessels where appropriate to aid emergency situations and warn vessels; • application for and use of safety zones to protect the construction/ decommissioning of the sites; • use of appropriate means to notify and provide evidence of the infringement of construction safety zones; • use of vessels that are 'fit for purpose' for the construction activities including marked in accordance with International Regulations for the Prevention of Collisions at Sea (COLREGS) and fitted with an AIS transponder to prevent them becoming a risk factor;	Section 6 - Construction procedures Section 6.4 - Stage 1: Seabed preparation Section 6.5 - Stage 2 & Stage 3 – WTG jacket suction bucket substructure assembly & installation Section 6.6 - Stage 4: WTG piled foundation substructure

Source	Reference to the relevant section of the ES / other document	Details of commitment	Relevant section of this document
		• Aids to Navigation in line with International Association of Lighthouse Authorities (IALA) O-139 (IALA, 2008) and MCA/ NLB Requirements (which will include a system of routine inspection and maintenance of lights and markings); • additional buoyage if required to assist safe navigation (this would be based on guidance from NLB); • creation of an Emergency Response Co-operation Plan (ERCoP) with the relevant Maritime Rescue Co-ordination Centre (MRCC) from construction phase onwards, including MCA standards and procedures for WTG shut - down in the event of a search and rescue, counter pollution or salvage incident in or around a OWF; • monitoring by radar, AIS and Closed Circuit Television (CCTV) or other agreed means; • fenders/ bumper bollards installed on structures; • clear notification of works (especially pre charting of cables); • subsea cables will be buried or trenched where possible to provide protection from dragged and dropped anchors and dropped objects; • where burial/ trenching is not possible, cables will be protected by other means such as rock dumping and concrete mattresses; • any cables installed within the cable corridor will be notified to Kingfisher Information Services and Cable Awareness (KISCA) for inclusion in cable awareness charts and plotters for the fishing industry; • consultation with fisheries stakeholders through the proposed regional Fisheries Working Group (see Chapter 14: Commercial Fisheries) to ensure that the cable protection method does not inhibit fishing activities; and	assembly and installation Section 6.9 - Stage 7: Commissioning Section 6.7 - Stage 5: Inter-array cable Section 6.8 - Stage 6: Wind Turbine Generator (WTG) installation

Source	Reference to the relevant section of the ES / other document	Details of commitment	Relevant section of this document
		• cable burial and bundling to reduce the effect of electromagnetic interference.	
ES September 2012	Shipping and Navigation – 15.283	CCTV will be installed to enable coverage of the OWF areas from key locations either on the WTGs or the substations. The CCTV will be adjustable for day/ night conditions and allow operators in a central control room to identify vessel names from a distance to facilitate radio communications.	6.3 - Construction Ports and Marine Coordination Centre
ES September 2012	Archaeology and Cultural Heritage – 17.56	Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as WTG and array cable installation, and anchoring or deployment of jack -up legs. PA exclusion zones of at least 50m will be established around those of medium sensitivity HA14, HA25, HA43, HA47, HA64, HA77, HA106, HA112, HA132, HA225, HA230, HA248, HA268 and HA365.	Section 6 - Construction procedures
ES September 2012	Archaeology and Cultural Heritage – 17.71	Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as WTG and cable installation, and anchoring or deployment of jack-up legs. PB exclusion zones of at least 100m will be established around HA1001, HA1004 and HA1008. PB exclusion zones of at least 50m will be established around those of medium sensitivity HA81, HA88, HA101, HA118, HA133, HA175, HA176, HA177 and HA409.	
ES September 2012	Mitigation and Monitoring – 22.17	Following detailed design, consideration will be given to micro-siting WTGs within each OWF site.	Section 6.5.3 - Mitigation and good working practices

Source	Reference to the relevant section of the ES / other document	Details of commitment	Relevant section of this document
ES September 2012	Mitigation and Monitoring – 22.34	Mitigation leading to preservation in situ will be preferred where possible. Where cultural heritage assets may potentially be subject to direct effects, infrastructure may be micro-sited and temporary exclusion zones implemented to prevent invasive activities (such as WTG and array cable installation or anchoring of vessels or deployment of jack-up legs) from damaging those assets. Exclusion zones of at least 100m will be implemented around cultural heritage assets defined in the assessment as of high sensitivity and 50m around assets defined as of medium sensitivity	Section 6 - Construction procedures
ES Addendum October 2012	4.120	Seabed preparation activities will require a licence under the Marine (Scotland) Act 2010 for Dredging and Deposit of Solid Waste in the Territorial Sea and UK Controlled Waters Adjacent to Scotland.	Section 6.4 - Stage 1: Seabed preparation

Table D.2: Mitigation and good working practices specific to WTG piled foundation substructure assembly and installation.

Source	Reference to the relevant section of the ES/ other document	Details of commitment	Reference (this document)
ES September 2012	Mitigation and Monitoring – 22.26	Nearer to the time of construction, the application of mitigation methods addressing noise caused by piling of jacket structures / foundations in deep water will be considered, as well as alternative non-piled substructure / foundation solutions	Section 6.6.

Table D.3: Mitigation and good working practices specific to inter-array cable installation.

Source	Reference to relevant section of ES/ other document	Details of commitment	Reference (this document)
ES September 2012	Physical Environment – 7.182, 7.192, 7.287	The total volume of seabed sediments that might be mobilised - associated with array cable installation- will be released in a phased approach dependent upon the rate of excavation and across a minimum six months annual construction period for three years.	Section 6.7 - Stage 5: Inter-array cable
ES September 2012	Physical Environment – 7.273	Efforts will be made to optimize the length of cable that will achieve target burial depth and therefore the amount of cable protection required will be minimised.	
ES September 2012	Commercial Fisheries – 14.164, 14.246 Shipping and Navigation - 15.125	For the majority of this length cables will be buried, with approximately 10% being protected by other means (i.e. rock placement or concrete mattresses).	
ES September 2012	Marine Mammals – 13.499	The array cables will be shielded to meet industry standards and will be buried to a depth of between 0.5 m and 2.1 m. This mitigation is in place with regard to potential impacts (EMF) on marine mammals.	

Appendix E – Pro-forma and contact details for key Seagreen personnel, contractors and sub-contractors

PRO-FORMA

This pro-forma is for the notification to Scottish Ministers of any agents, contractors or sub-contractors that will carry out any licensed marine activities, as required under Section 2.6 of Marine Licence 04676/19/0 and 04677/19/0.

This pro-forma should be completed prior to commencement of any licenced activity, and whenever there is a material change to any agents, contractors or sub-contractors.

Complete the details in the table below.

Role	Company Name	Address	Contact Name
TBC	TBC	TBC	TBC
TBC	TBC	TBC	TBC
TBC	TBC	TBC	TBC
TBC	TBC	TBC	TBC

CONTACT DETAILS FOR KEY SEAGREEN PERSONNEL, CONTRACTORS AND SUB-CONTRACTORS

Role	Organisation/Company	Telephone/Mobile	Email
Seagreen Project Manager	Seagreen	TBC	TBC
Seagreen Package Manager [1]	Seagreen	TBC	TBC
Seagreen Package Manager [2]	Seagreen	TBC	TBC
Seagreen Package Manager [3]	Seagreen	TBC	TBC
Seagreen Client Representative	Seagreen	TBC	TBC
Seagreen Marine Coordinator	Seagreen	TBC	TBC
Seagreen Compliance Manager	Seagreen	TBC	TBC
Seagreen Safety Health and Environment (SHE) Manager	Seagreen	TBC	TBC
Seagreen Ecological Clerk of Works (Offshore ECoW)	Seagreen	TBC	Derek.Duckett@sse.com
Contractor	TBC	TBC	TBC
Contractor	TBC	TBC	TBC
Contractor	TBC	TBC	TBC