European Offshore Wind Deployment Centre

Operation & Maintenance Programme

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Revision	Date	Revision changes
03	17/12/18	Final for submission to Marine Directorate
04	21/06/19	Internal updates following discussion with Marine Directorate
05	09/07/19	2nd Revision submitted to Marine Directorate
06	02/10/19	Final submission to Marine Directorate following AOWFL updates
07	12/02/20	Section 7 updated with SEPA consultation outcome
08	15/03/21	Internal update - Schedule updated with further details of non-licensable activity
09	16/08/2024	Addition of Livelink sensors to the nacelles and update of Vattenfall positions
10	16/05/2025	Major Component Exchange update

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LIST OF ABBREVIATIONS AND DEFINITIONS

Defined Terms

Term	Definition
Application	The Application and Environmental Statement submitted to the Scottish Ministers, by the Company on 1st August 2011 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 6th August 2012 for consent under section 36 of the Electricity Act 1989 and for a Marine Licence under 20(1) of the Marine (Scotland) Act 2010, for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC) electricity generating station approximately 2 km off the coast of Aberdeenshire in Aberdeen Bay with a generation capacity of up to 100 MW.
Blackdog Firing Range Management Plan	The Management Plan required to be submitted for approval under Condition 10 of the section 36 Consent.
Company	Aberdeen Offshore Wind Farm Limited (AOWFL). AOWFL is wholly owned by Vattenfall and has been established to develop, finance, construct, operate, maintain and decommission the European Offshore Wind Deployment Centre.
Completion of the Works	The date on which the Works have been installed or the Works have been deemed to be complete by the Licensing Authority, as defined by the Marine Licence.
Consent Plans	The plans, programmes or strategies required to be approved by the Scottish Ministers (in consultation with the appropriate stakeholders) in order to discharge conditions attached to the Offshore Consents.
Contractors	Any Contractor/Supplier (individual or firm) working on the project, hired by AOWFL.
Decommissioning of the Works	The removal of the Works from the seabed, demolishing or dismantling the Works.
Decommissioning Programme (DP)	The Programme to be submitted to the Secretary of State[1] under section 105(2) of the Energy Act 2004 (as amended) and as required for approval under Condition 6 of the section 36 Consent.
Development	The European Offshore Wind Deployment Centre electricity generating station in Aberdeen Bay, approximately 2 km east

[1] The responsibility for approving decommissioning programmes for Scottish projects has now been transferred to the Scottish Ministers.

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Term	Definition
	of Blackdog, Aberdeenshire, as described in Annex 1 of the section 36 Consent.
Environmental Statement (ES)	The Statement submitted by the Company on 1 August 2011 as part of the Application.
Inter-array cables	Electricity cables connecting the WTGs.
Licensable Marine Activity	Any activity listed in section 21(1) of the 2010 Act.
the Licensee	Aberdeen Offshore Wind Farm Limited, a company registered in Scotland (registered number SC278869).
Licensing Authority	Scottish Ministers, as defined by the Marine Licence. It is important to note that Marine Directorate is acting on behalf of Scottish Ministers.
Marine Licence	Licence issued by the Scottish Ministers under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Export Cable Corridor.
Offshore Consents	• Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC; • Declarations granted under section 36A of the Electricity Act 1989 to extinguish public rights of navigation so far as they pass through those places within the territorial sea where structures forming part of the Offshore Wind Farm are to be located; and • Marine Licence under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Offshore Export Cable.
Offshore Export Cables (OECs)	The offshore export cables (and all associated cable protections) connecting the WTGs to the onshore export cables.
Offshore Export Cable Corridor Landfall	The location where the offshore export cables come ashore.
Offshore wind farm	An offshore generating station which includes proposed WTGs, inter-array cables, meteorological masts and other associated and ancillary elements and works (such as metocean buoys). This includes all permanent and temporary works required.
Section 36 Consent	Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC.
Subcontractor	Any Contractor/Supplier (individual or firm) providing services to the project, hired by the Contractors (not AOWFL).

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Term	Definition
Supplementary Environmental Information Statement (SEIS)	The Statement (Addendum) submitted to the Scottish Ministers by the Company on 6th August 2012 as part of the Application.
the Works	The European Offshore Wind Deployment Centre electricity generating station in Aberdeen Bay, approximately 2 kilometres east of Blackdog, Aberdeenshire, as described by the Marine Licence.

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Acronym Definitions

Term	Definition
AOWFL	Aberdeen Offshore Wind Farm Limited
BFRMP	Blackdog Firing Range Management Plan
CLS	Cable Laying Strategy
CPP	Cable Protection Plan
DIO	Defence Infrastructure Organisation
DP	Decommissioning Programme
EIA	Environmental Impact Assessment
Electricity Act	the Electricity Act 1989 (as amended)
EMP	Environmental Management Plan
ENSU	Environment and Sustainability
EOWDC	European Offshore Wind Deployment Centre
ES	Environmental Statement
FLO	Fisheries Liaison Officer
FMS	Fisheries Mitigation Strategy
HSE	Health, Safety and Environment
km	Kilometre
LNtM	Local Notice to Mariners
MOD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
MMPP	Marine Mammal Protection Plan
MD	Marine Directorate
MD-LOT	Marine Directorate – Licensing and Operations Team
MW	Megawatt
NMP	Navigational Marking Plan
NSP	Navigational Safety Plan
OECs	Offshore Export Cables
OEMP	Offshore Environmental Management Plan
ODA	Offshore Danger Area
O&M	Operation and Maintenance
PEMP	Project Environmental Monitoring Programme

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Term	Definition
SEIS	Supplementary Environmental Information Statement
SRL	Self Retracting Line
UK	United Kingdom
VMP	Vessel Management Plan
WMP	Waste Management Plan
WTG	Wind Turbine Generator

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1 INTRODUCTION

1.1 Background and Purpose

Aberdeen Offshore Wind Farm Limited (AOWFL)[2] received consent from the Scottish Ministers under Section 36 (S.36) of the Electricity Act 1989 for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC – also known as the Aberdeen Offshore Wind Farm) in 2013 and a Marine Licence was attained under section 25 of the Marine (Scotland) Act 2010 in 2014 (latest reference 04309/19/0).

The EOWDC is located 2 km to the north east of Aberdeen, within Aberdeen Bay. Construction of the wind farm commenced on 1st November 2017 and the site was completed on 17th September 2018. The project consists of 11 MHI Vestas V164-8.0 MW Wind Turbine Generators (WTGs) (8.8 MW Power Mode), inter-array cables and two export cables which make landfall at Blackdog, Aberdeenshire (Figure 1). The operation and maintenance (O&M) team is based at Aberdeen Harbour.

Condition 3.4.5 of the Marine Licence requires the submission of an Operation and Maintenance Programme (the O&M Programme) (see Table 1). The purpose of the O&M Programme is to set out the likely O&M activities which will or may be required over the lifetime of the wind farm, and to provide a procedure for managing and/or consenting these activities. The scope of this O&M Programme is for activities seaward of Mean High Water Springs (MHWS) only.

This O&M Programme was submitted to Marine Directorate Licensing and Operations Team (MD-LOT) on 17th December 2018. It was discussed during a telecon with MD-LOT on 16th January 2019 and during a face to face meeting on 21st May 2019. This O&M Programme has now been updated to reflect these discussions with MD-LOT and to address comments made.

Table 1: Consent conditions relevant to the O&M Programme

Consent	Condition No	Condition
Marine Licence	3.4.5	The Licensee must provide an Operation and Maintenance Programme to the Licencing Authority within 3 months of the Completion of the Works. Notification must be provided at least 3 months in advance of any subsequent maintenance works where any additional deposits are required. In the event that these works are not assessed in the Application, and are considered by the Licencing Authority as being a material change to the licence, they will require further Marine Licences.

[2] AOWFL is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain and decommission the EOWDC.

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The overarching framework for the management of environment and consents during the O&M phase is set out in the Offshore Environmental Management Plan (OEMP) approved by MD-LOT.

The O&M Programme is structured as follows:

Section 2: This section sets out the roles and responsibilities of AOWFL during the O&M phase with respect to implementing the O&M Programme and general O&M phase consents compliance;

Section 3: Sets out other relevant EOWDC Consent Plans which are linked to the O&M Programme and together form part of the suite of O&M phase consents management documentation;

Section 4: Presents the Schedule of O&M Activities which may be required at the EOWDC over the lifetime of the project;

Section 5: Provides a procedure for licensing any additional activities; and

Section 6: Sets out the communication, notification and reporting processes associated with O&M activities.

Where it is necessary to update this O&M Programme AOWFL will consult with MD-LOT to discuss and agree the proposed changes prior to updating the document.

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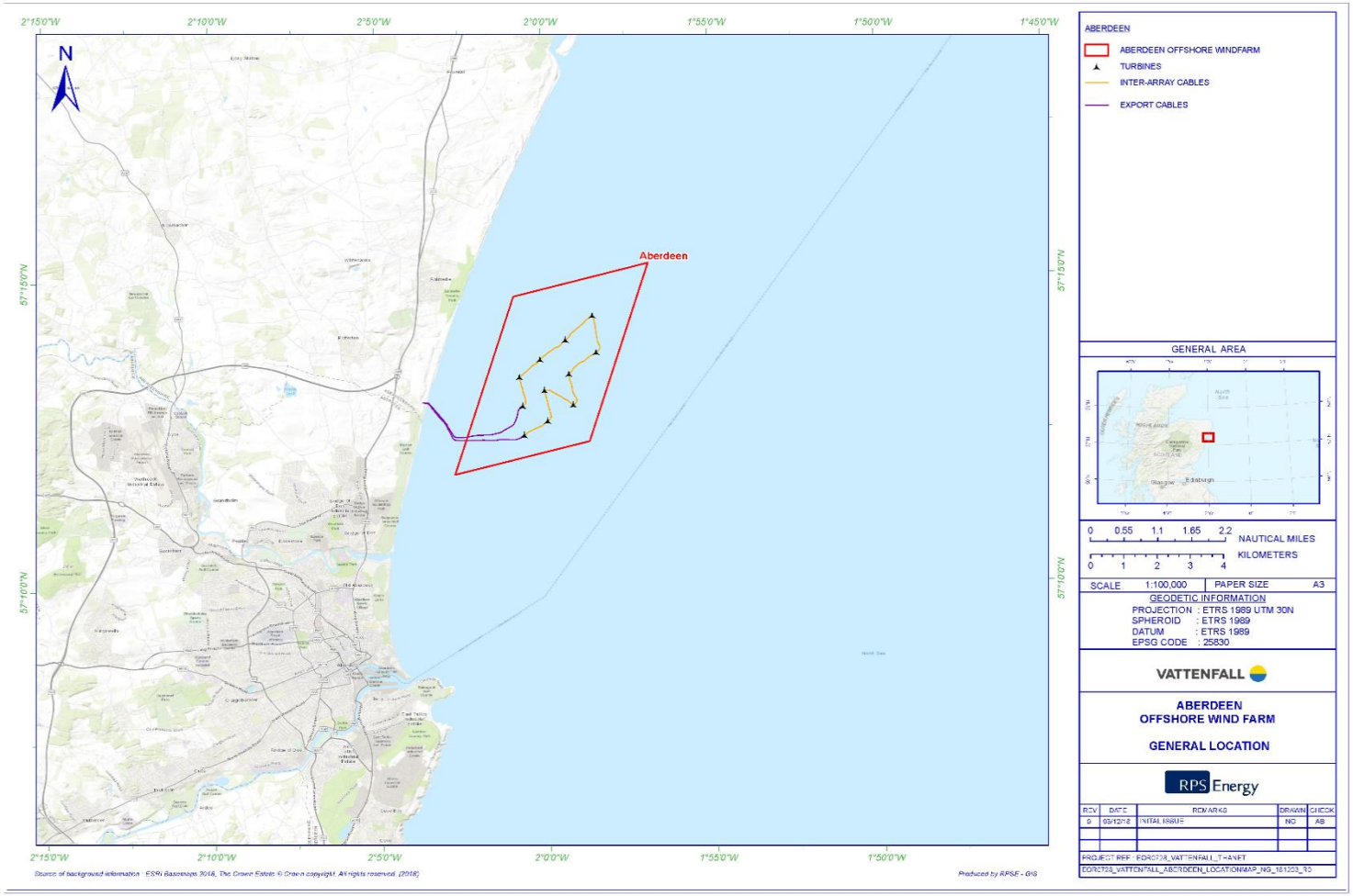
Figure 1: EOWDC General Location



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2 ROLES AND RESPONSIBILITIES

2.1 Overview

The EOWDC is operated and maintained by AOWFL. The O&M team is based at Aberdeen Harbour and manages the day to day activities at the site. This section sets out the roles and responsibilities of AOWFL during the O&M phase with respect to delivering the O&M Programme.

The key roles relevant to the delivery and implementation of the O&M Programme are:

- Site Manager;
- O&M Manager;
- H&S Manager;
- Consents Manager
- Environment and Sustainability (ENSU) Specialist;
- Fisheries Liaison Officer;
- Service Lead;
- Marine Coordinator;
- Contractors and Subcontractors.

2.2 Site Manager

The Site Manager is responsible for leading the EOWDC O&M team. The Site Manager has the following responsibilities in relation to the O&M Programme:

- Ensuring that sufficient resources and processes are in place to deliver and comply with the O&M Programme;
- Ensuring that all personnel and contractors assist and support the Consents Manager where required in delivering the O&M Programme;
- Participating in regular environment and consents meetings;
- Establishing contractual obligations for Contractors and Subcontractors in relation to the O&M Programme;
- Addressing any non-compliance.

2.3 O&M Manager

The O&M Manager is responsible for the management of EOWDC assets and daily operations on site. The O&M Manager manages a team of technicians and oversees maintenance work such as component repairs. The O&M Manager has the following responsibilities in relation to the O&M Programme:

- Ensuring Vattenfall best practice is implemented throughout the O&M phase;

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- Ensuring all personnel have site inductions and any further information, instruction, training and supervision needed for the work;
- Ensuring H&S compliance for all O&M activities; and
- Establishing systems to ensure compliance with this O&M Programme and other relevant Consent Plans.

2.4 H&S Manager

The H&S Manager is responsible for providing support, advice and guidance on all aspects of Health, Safety & Environmental (HSE) management on the Project. Key responsibilities relevant to the O&M Programme include the following:

- Coordinating the development, monitoring and implementation of AOWFL H&S management plans, which will be implemented alongside the O&M Programme;
- Providing H&S support, advice and guidance to the AOWFL Project team;
- Coaching of the Project team to facilitate improvements in HSE performance;
- Participating in regular environment and consents meetings;
- H&S auditing and reporting.

2.5 Consents Manager

The Consents Manager will have day to day responsibility for ensuring ongoing compliance with the O&M Programme. Key responsibilities relevant to the O&M Programme include the following:

- Review and QA of the O&M Programme;
- Provision of advice to AOWFL on compliance with the O&M Programme;
- Monitoring of compliance with the O&M Programme;
- Supporting regular environment and consents meetings;
- Liaison with MD-LOT, statutory bodies and stakeholders;
- Managing the process of obtaining new consents where necessary;
- Maintaining effective communications between AOWFL, Contractors, stakeholders, conservation groups and other users of the sea.

2.6 Environment and Sustainability (ENSU) Specialist

The Environment and Sustainability (ENSU) Specialist is responsible for providing support, advice and guidance on all aspects of environment and sustainability on the Project. Key responsibilities relevant to the O&M Programme include the following:

- Reviewing contractor documentation (e.g. Method Statements and Risk

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Assessments) to ensure compliance with the O&M Programme and associated Consent Plans;

- Providing Environmental support, advice and guidance to the AOWFL Project team
- Leading regular environment and consents meetings;
- Maintaining effective communications between AOWFL, Contractors, stakeholders, conservation groups and other users of the sea.
- Environment and auditing and reporting.

2.7 Fisheries Liaison Officer

The Fisheries Liaison Officer (FLO) will work closely with the Consents Manager and the O&M team to facilitate coexistence between the EOWDC and commercial fishing interests, in accordance with the Fisheries Mitigation Strategy (FMS). Key responsibilities relevant to the O&M Programme include the following:

- To be the key point of contact for local fisheries stakeholders;
- To identify individual commercial vessels and skippers operating in the offshore area;
- To establish and maintain a strong working relationship with the local fishing industry;
- To have a detailed understanding and awareness of the local fishing industry;
- To understand the potential impact of the EOWDC on fishing activities;
- To communicate clearly and accurately with the fishing industry on behalf of AOWFL;
- To ensure information is made available and circulated in a timely manner to minimize interference with fishing activities and other users of the sea; and
- Establish and maintain effective communication between AOWFL, contractors, subcontractors, fishermen and other users of the sea.

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2.8 Service Lead

The Service Lead is responsible for coordination with the O&M Manager to ensure that maintenance requirements are fulfilled. Key responsibilities relevant to the O&M Programme include the following:

- Program and performance reports on ongoing campaigns;
- Working closely with the warehouse and logistics coordinators, supporting the logistics of moving spares and equipment;
- Supporting the O&M Manager in creating work packs for specific work scopes;
- Working closely with the O&M team to verify maintenance schedules and method statements for all scheduled maintenance;
- Supporting the H&S Manager, Consents Manager and ENSU Specialist to ensure all health, safety, consents and environment requirements are assured when carrying out the planned maintenance campaigns.

2.9 Marine Coordinator

The Marine Coordinator is responsible for daily marine coordination at the EOWDC including communication with vessels and tracking of personnel within the site. The Marine Coordinator has the following responsibilities in relation to the O&M Programme:

- Responsible for external communications relating to navigational safety;
- Engaging in emergency response activities; and
- Ensuring that HSE issues are reported, as required.

2.10 Contractors and Subcontractors

All Contractors and Subcontractors shall ensure that their own procedures comply with the requirements of this O&M Programme and other relevant Consent Plans. Contractors and Subcontractors have the following responsibilities in relation to the O&M Programme:

- Ensuring that sufficient resources and processes are in place to comply with the O&M Programme and other relevant Consent Plans;
- Producing and maintaining records of activity on site and communicating those to the H&S Manager, Consent Manager and ENSU Specialist; and
- Liaising with the O&M Manager, H&S Manager Consent Manager and ENSU Specialist.

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3 OTHER RELEVANT CONSENT PLANS

This O&M Programme forms part of a suite of O&M phase consents management documentation which will be complied with over the lifetime of the EOWDC Project. The OEMP provides the overall framework for environmental management and consents compliance during the O&M phase, and the O&M Programme will be delivered within this framework.

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Table 2 summarises the Consent Plans which are linked to this O&M Programme and identifies the key relevant sections for reference. The Consent Manager will ensure compliance with these plans during O&M activities at the site. Further detail on the notification and reporting requirements specified in these plans in relation to O&M activities is provided in Section 6.

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Table 2: Consent Plans Relevant to the O&M Programme

Consent Plan	Relevance to O&M Programme	Key Sections
Offshore Environmental Management Plan (OEMP)	The Offshore Environmental Management Plan (OEMP) provides the overarching framework for environmental management during the O&M phase. O&M activities described in this O&M Programme will be undertaken in line with the environmental management measures described in the OEMP. The OEMP also includes the Project Environmental Monitoring Programme (PEMP), Waste Management Plan (WMP) and Marine Mammal Protection Plan (MMPP). The PEMP sets out the monitoring programme, including survey and monitoring activity during the O&M phase. The WMP sets out waste management procedures and the general principles for waste management for all AOWFL personnel, Contractors and Subcontractors. The MMPP sets out management measures for the reduction of potential impacts to marine mammals. For the O&M phase this is focused on vessel operations and is set out further in the Vessel Management Plan (VMP).	• Section 5: The Draft EMP Commitments • Section 6: Environmental Management Framework • Section 6.4: OEMP Roles and Responsibilities • Section 6.6: OEMP Communications and Reporting • Section 6.7: Emergency Response Plan • Section 6.8: Incident Reporting • Section 6.9: Notification of Dropped Objects • Section 6.10 Auditing of the OEMP Performance and Compliance • Section 7 & Appendix B : Waste Management Plan • Sections 8 to 11: Environmental Management and Mitigation of Effects of key receptors • Section 12: Species Protection Plans • Section 13: Environmental Monitoring Programme • Section 14: Marine Mammal Protection Plan • Section 15: Compliance with Application and Associated Addendum • Appendices A to F
Marine Pollution Contingency Plan (MPCP)	The Marine Pollution Contingency Plan (MPCP) makes provisions in respect of spills and collision incidents and sets out the procedures to be followed in the event of an oil or chemical spill.	• All Sections
Blackdog Firing Range Management Plan (FRMP)	The Blackdog Firing Range Management Plan (FRMP) sets out operational procedures to ensure the safety of vessels, installations and personnel with regards to the Blackdog firing range in the vicinity of the Project, and to ensure activities undertaken at the firing range are not compromised during O&M activities. All relevant method statements developed by contractors involved in the EOWDC will need to comply with the procedures set out in the FRMP.	• All Sections
Vessel Management Plan (VMP)	The Vessel Management Plan (VMP) provides detail on vessel activity associated with the EOWDC and describes the management measures in relation to disturbance of birds and marine mammals.	• Section 5: Location of Base Ports (Section 5.3: Operational Ports) • Section 6: Management and Coordination of Vessels (Section 6.3: Operational and Maintenance Phase) • Section 7: Types and Specifications of Vessels (Section 7.3: Operational Phase)

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Consent Plan	Relevance to O&M Programme	Key Sections
	Details include the location of working ports and an indication of corridors for vessels transits, how often vessels will transit, vessel coordination, working practices to minimise the unnecessary use of ducted propellers and the number, types and specification of vessels.	• Section 8: Numbers and Movements of Vessels (Section 8.3: Operation and Maintenance Vessels) • Section 9: Indicative Transit Route Corridors • Section 10.4: Reporting during Operation and Maintenance Phase • Section 11 & 12: Environmental Sensitivities relevant to Vessel Management and Potential Effects of Increased Vessel Activity on Environmental Sensitivities • Section 13: Working Practices related to Ducted Propeller Use • Section 14: Compliance with the Application, ES and SEIS • Appendix A – Compliance with ES/SEIS mitigation measures
Cable Laying Strategy (CLS)	The Cable Laying Strategy (CLS) also incorporates the Cable Attenuation Plan and the Cable Protection Plan (CPP). The CLS provides details of the mitigation measures to be applied during operation where relevant (e.g. for cable repairs, remedial cable protection etc.).	• Section 6: Location and Layout of Inter-Array and Offshore Export Cables • Section 7: Technical Specification of Cables • Section 9: Cable Installation Methodology • Section 10: Cable Protection Plan • Section 11: Cable Operation and Maintenance • Section 12: Compliance with Application and Associated Addendum • Appendix A: Compliance with Rochdale Envelope Parameters • Appendix B: Compliance with Mitigation Measures
Navigational Safety Plan (NSP)	The Navigational Safety Plan (NSP) sets out the navigational safety measures to be applied during operation of the EOWDC. The plan includes safety measures including marine coordination, safety zones, management of O&M activities, recommended routes and entry/exit gates and vessel safety requirements. Additional information is also provided on anchoring areas, notifications to other sea users, emergency response and compliance with the original application.	• Section 6: Navigational Safety Measures during Operations and Maintenance • Section 7: Anchoring • Section 8: Blackdog Firing Range Management Plan • Section 9: Promulgation of Information • Section 10: Emergency Response • Section 11: Compliance with Application and SEIS • Appendix B: Compliance with ES/SEIS Mitigation Measures
Navigational Marking Plan (NMP)	The Navigational Marking Plan (NMP) outlines the navigational lighting and marking required for the EOWDC, during both the construction and operational phases.	Section 4: Operational Phase, including: • Section 4.1: Lighting • Section 4.2: Signage • Section 4.3: Paint • Section 4.4: Buoyage • Section 4.5: Foghorns • Section 4.6: Automatic Identification System

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Consent Plan	Relevance to O&M Programme	Key Sections
		• Section 4.7: Aviation Lighting • Section 4.8: Operational Navigational Marking Plan Summary
Fisheries Mitigation Strategy (FMS)	The Fisheries Mitigation Strategy (FMS) aims to facilitate coexistence between the EOWDC and commercial fishing interests over the lifetime of the EOWDC. The FMS sets out the roles and responsibilities of AOWFL and the Fisheries Liaison Officer (FLO) in undertaking communication with commercial fishing interests. Other key details include information dissemination and establishing clear communication between relevant parties.	• All Sections
Decommissioning Programme (DP)	The Decommissioning Programme (DP) sets out the strategy for decommissioning the EOWDC at the end of the operational lifecycle.	• All Sections

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4 SCHEDULE OF O&M ACTIVITIES

4.1 Overview

To ensure the EOWDC operates safely and efficiently the offshore assets will be subjected to a number of routine or scheduled maintenance activities that are carried out on a regular basis. There may also be occasions when unscheduled maintenance activities are required to repair or replace faulty components. This section provides a list of all potential O&M activities identified to date by AOWFL in the form of a Schedule of O&M Activities. This Schedule may be updated in consultation with MD-LOT over the project lifetime.

4.2 O&M Activities

This section provides the Schedule of O&M Activities for WTGs and Foundations (Table 3) and Inter-array and Offshore Export Cables (Table 4) including a description of the activity, an outline of the method to be employed, and the currently expected frequency of the activity.

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Table 3: Schedule of O&M Activities for WTGs and Foundations

Activity	Description	Method	Frequency or worst case scenario
Routine inspection and maintenance activities	Inspection (visual or subsea ROV) & maintenance of corrosion protection systems, specified coating systems, and components including Safety Retracting Line (SRL), Jacket lighting, boat landings and Davit crane.	Inspection and maintenance of corrosion protection systems, including coating and cathodic protection, is split between areas above and below water.	Visual inspections of coating protection above water are planned on a yearly basis. Below water, general visual inspections of the substructure components are planned every 5 years; the cathodic protection system is visually inspected and sacrificial anodes tested within the first year of operation, being anode testing planned every 3 years and visual inspection planned every 5 years thereafter. All below water inspections and surveys are performed using ROVs.
Surveys of Scour Protection for Foundation Structures	After scour protection installation, scour surveys are planned for the second and fifth year of operation and every five years thereafter following recommended inspection and maintenance plan.	ROV survey from support vessel around base of foundations.	After scour protection installation, scour surveys are planned for the second and fifth year of operation and every five years thereafter following recommended inspection and maintenance plan.
Repair / replace Self Retracting Line (SRL)	Replace SRLs as required on the external foundation.	CTV access. Detach fall arrest system from supporting bracket (bolted connection) on relevant platform. Replace SRL for a functional one and attach to supporting bracket. SRL removed is taken back to shore for repair so it can be used as spare SRL.	As required.
Repairs to lighting / navigation aids	Replace lighting / navigation aids as required on the external foundation.	Access to transition piece platform via CTV. Servicing and replace of navigation	As per S.36 Consent.

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		aids / lighting as per OEM recommendations.	
Service of any of the auxiliary systems in the foundation transition piece	Auxiliary systems are regularly serviced as per manufacturer recommendations. If fault in a system, then repair undertaken.	Repair fault in equipment or system according to manufacturer manuals.	As per manufacturer recommendations. If fault in a system, then repair undertaken.
Minor repairs to access ladders and boat landings (e.g. replacing bolts).	Repair and replacement of small components associated with the access ladders and boat landings, e.g. bolts. Cutting and welding might be required.	Divers deployed via a diving support vessel, CTVs for transfer of personnel.	As required.
Davit crane repair	Repair of davit cranes on the WTG foundation.	Repaired in situ. CTV for transfer of personnel.	As required.
Annual / routine servicing	Routine servicing as per the Service Availability Agreement	Every main component of the WTG is inspected and serviced annually, working to approved written procedures. Consumable items such as filters, brake linings, carbon brushes, grease cartridges are replaced as required. AOWFL has a five year service agreement with MHI Vestas covering the maintenance of the turbines, tower internal platforms, high voltage switchgear, SCADA and instrumentation and the statutory certification of lifting equipment, anchor/rescue points, fall arrest and pressurised systems.	As per the Service Availability Agreement

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Gear and hydraulic major oil exchange and refuelling activities	Exchange of oil in the WTG hydraulic system and gearbox, and refuelling of generators as part of long term maintenance	Technicians and equipment deployed from CTV or similar vessel. Oil extraction and replacement completed from a suitably equipped vessel for oil storage and transport.	As required.
Replacement of corrosion protection anodes (external only)	Replace anodes required for corrosion protection of the external foundation.	Divers or ROVs deployed via a dive support vessel, CTV or similar vessel. Mechanical connection or welding as required.	Replacement of a full set of anodes at approx. 5% of WTGs per year (i.e. 1 x WTG per year).
Paint repairs to boat landing area and general foundation areas	Application of primer and paint system (e.g. Interzone 954 or equivalent) or other coatings to protect the foundations from corrosion (internal/external). Includes surface repair and preparation work.	Technicians and equipment deployed from CTV or similar vessel. Surface preparation to break down existing surface coating and any associated rust using grinding or blasting methodology. Primer and paint repair applied using brush or spray technique.	Patching up work at all WTG foundations every 1 or 2 years.
Removal of marine growth and/or guano	Removal of marine growth and/or guano from the boat landing, access ladders and wave rider buoy(s). To provide safe access for personnel transferring to the WTG foundation.	High-pressure jet-wash (sea water only) from CTV.	Removal of marine growth on average four times per year per foundation.
Additional scour protection	No further scour protection is currently scheduled. However, if any of the surveys during the lifetime of the Project identify a major issue with the scour protection, additional scour protection might be required by Construction Support Vessel (CSV).	Additional scour protection will be installed using a fall pipe around the suction bucket with a total thickness of approximately 1.5 m. An ROV will be used for visual checks on the scour protection.	As required.

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J Tube and seal repairs	Modify or repair J tubes and seals at point of cable entry during inter-array or export cable repair works.	Divers deployed via a diving support vessel, CTVs for transfer of personnel and small barge or similar vessel for products and equipment.	Up to 8 modifications to J-tubes over the lifetime of the wind farm, based on repair of up to three inter-array cables (see below) and the two export cables which connect to the WTGs.
Major component replacement	Replacement of major components. (WTG blades, gearbox, generator, 66 kV transformer or switchgear).	Jack-up vessel or DP platform supply vessel (component depending) for lifting to/from the WTG.	Major component replacement at up to six WTGs per year. On average, a jack-up vessel may be in position at an individual WTG location for 12 days, assuming some weather downtime. Shorter durations may apply in good weather conditions. Generally, a jack-up vessel will be in a single position only for a component replacement, and will remain jacked-up until replacement has been completed.
Replacement of access ladders / boat landing	Replacement of access ladders and boat landing due to collision damage or corrosion.	Divers or ROVs deployed via a dive support vessel, CTV or similar vessel. Small jack-up or DP platform supply type vessel for replacement for boat landing.	Repairs and replacements at up to 10% WTGs per year (i.e. 1 x WTG per year).
Painting or other coatings to WTG tower, nacelle or blades	Paint or other coatings applied (internal/external).	Technicians and equipment deployed from CTV or similar vessel. Rope access may be required to reach certain areas of blades or tower.	Coatings on the blades and tower required once per year per WTG. Marine Pollution Contingency Plan measures applied to the Construction Phase will be applied to the O&M phase.
Blade and hub / spinner repair	Minor repairs to hub /spinner or blade damage (potential stress from turbulence or lightning strike)	Technicians and equipment deployed from CTV or similar vessel. Rope access may be required to reach damaged areas.	Inspection and repair of Leading Edge Protection every three years per WTG.

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Livelink sensor maintenance	Inspection and maintenance of sensors including replacing damaged components, repair, cleaning sensors, adjustment of sensors	Inspection and maintenance of corrosion protection systems, including coating and cathodic protection, is split between areas above and below water.	Visual inspections will be adhoc and only corrective maintenance will be conducted as there are no parts that require specific servicing.

Table 4: Schedule of O&M Activities for Inter-Array and Offshore Export Cables

Activity	Description	Method	Frequency or worst case scenario
Cable Inspection	No specific maintenance is required. However, assessment of the installed cables will be undertaken to identify any areas at risk of exposure.	Where it is determined that there is a risk of exposure, periodic visual inspections of the circuits by ROVs will be carried out as required. In addition there will be routine walk downs by AOWFL technicians of the onshore cable to ensure no sections of the cable have become unburied.	No specific maintenance is required. However, assessment of the installed cables will be undertaken to identify any areas at risk of exposure.
Reburial of inter-array cable	In the event that any section of inter-array or export cable becomes exposed following installation, AOWFL will use reasonable endeavours to rebury the cable (where technically feasible) as a preference prior to the use of additional cable protection material (see later activity).	It is expected that length of cable will be reburied using techniques as per initial installation, or a method with increased probability of success (i.e. more complete, longer lasting burial).	Up to three inter-array cable reburial events over the lifetime of the wind farm. Each reburial event up to 100 m in length. Relevant sections from the Cable Laying Strategy regarding burial will be applied to O&M phase.
Reburial of export cable (subtidal)		Cable reburial events will consist of the following activities: Detection of cable exposure; Pre-works survey where required; Cable reburial via mass flow excavator, water jet trencher/jetting ROV, or plough; and post-burial survey.	Up to five export cable reburial events over the lifetime of the wind farm. Each reburial event up to 800 m in length. Relevant sections from the Cable Laying Strategy regarding burial will be applied to O&M phase.
Reburial of export cable (intertidal)		Cable reburial events will consist of the following activities: Detection of cable exposure; Pre-works survey where required; Cable reburial via mass flow excavator, water jet trencher/jetting ROV, plough or backhoe dredger (if high tide),	Reburial of 1 x 152 m section of intertidal export cable over the lifetime of the wind farm (1 x repair/reburial event in total in the intertidal area).

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Activity	Description	Method	Frequency or worst case scenario
		or excavator (if low tide); Backfill via backhoe dredger/naturally (high tide) or excavator (low tide); and Post-burial survey.	Relevant sections from the Cable Laying Strategy regarding burial will be applied to O&M phase.
Repair of inter-array cable	Recovery and repair of a cable section using cable joints; or Replacement of a complete new length of cable (WTG to WTG).	Physically disconnect cables from electrical system and cable protection systems (if required). De-burial of damaged cable section. Recovery of damaged cable section to a cable repair vessel / barge. Complete cable repair joint (if required). Surface lay full new length of cable or repaired cable within existing cable corridor. Complete cable reburial using a jetting /trenching ROV unit. Replace cable protection system and physically reconnect cables to electrical system (if required). Specialist cable repair vessel would be required; or a cable lay vessel for full length cable replacement. Dive vessel may be required if a full length cable replacement (WTG to WTG) was required.	Up to three inter-array cable repair events over the lifetime of the wind farm. Each repair event up to 1,160 m in length. Relevant sections from the Cable Laying Strategy regarding burial will be applied to O&M phase.
Repair of export cable (subtidal)	Repair and replacement of export cable section (subtidal).	Cable repair will consist of the following activities: Pre-works survey where required; Removal of any existing scour/cable protection via divers or mechanical means; Pull cable out of seabed by the cable laying vessel or de-bury via jetting/air-lifting tool OR leave cable in place if possible; Repair via two joints: one inline joint (first) and then one omega joint (second); Lay repaired cable section and joints on the seabed; Burial via mass flow excavator, water jet trencher/jetting ROV, or plough;	As required

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Activity	Description	Method	Frequency or worst case scenario
		Replacement of scour/cable protection where necessary; Post-works survey.	
Repair of export cable (intertidal)	Repair and replacement of export cable section (intertidal).	Cable repair will consist of the following activities: Pre-works survey where required; Pull cable out of seabed by the cable laying vessel or de-bury via excavator/jetting/air-lifting tool OR leave cable in place if possible; Repair via two joints: one inline joint (first) and then one omega joint (second); Lay repaired cable section and joints on the seabed; Burial via mass flow excavator, water jet trencher/jetting ROV, plough or backhoe dredger (if high tide), or excavator (if low tide); Backfill via backhoe dredger/naturally (high tide) or excavator (low tide); and Post-works survey.	As required
Installation of small scale seabed cable protection	In the event that the cables cannot be reburied, to a depth sufficient to provide adequate protection, cable protection may be required along those sections subject to exposure.	Repair options would likely consist of placement of rock bags or cable protection matting/mattressing over exposed area via utility vessel and support barge.	Installation of protection along up to 800 m in length of export cable, following up to five repair events over the lifetime of the wind farm. Installation of protection along up to 100 m on inter array cable following up to three inter-array cable reburial events over the lifetime of the wind farm. Relevant sections from the Cable Laying Strategy regarding burial will be applied to O&M phase.

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5 PROCEDURE FOR LICENSING O&M ACTIVITIES

5.1 Overview

This section provides a procedure for licensing any O&M activities which are not deemed to be covered by existing licences or consents, and / or additional activities which are not currently foreseen. In the event that licensable marine activities are required that were not fully assessed in the Application and are considered by MD-LOT as being a material change to the licence, AOWFL will apply for a variation to the existing licence, or an additional Marine Licence / consent, in line with the requirements of Marine Licence Condition 3.4.5

The procedure presented below was agreed with MD-LOT during the meetings on 16th January 2019 and 21st May 2019.

5.2 Procedure

The procedure is set out in Figure 2. In the event that an activity is identified the AOWFL Consents Manager will gather details of the activity (e.g. description, methodology, duration and timing) and determine if the activity is a licensable marine activity with reference to the Marine (Scotland) Act 2010, MD-LOT guidance[3] or through other communication with MD-LOT.

If the activity is non-licensable then the Consents Manager will add the activity to the relevant Schedule of O&M Activities and advise the O&M team on any other steps to be taken prior to the commencement of the activity (e.g. any notifications).

If the activity is a licensable marine activity and was not assessed within the Application, then the Consents Manager will notify MD-LOT of the forthcoming licence application and discuss and agree the nature and scope of the application and any other requirements. AOWFL will prepare the licence application, and this will be submitted to MD-LOT at least 14 weeks in advance of the activity being required (in line with MD-LOT guidance[4]).

Any new awarded licences will form part of the Project consents and licences and the conditions of the licence will be managed by the Consents Manager alongside the requirements of the existing consents. The relevant Schedule of O&M Activities will be updated with any new activities and associated licences.

[3] For example: https://www2.gov.scot/Topics/marine/Licensing/marine/activities.
[4] Guidance for Marine Licence Applicants: https://www2.gov.scot/Resource/0052/00524064.pdf

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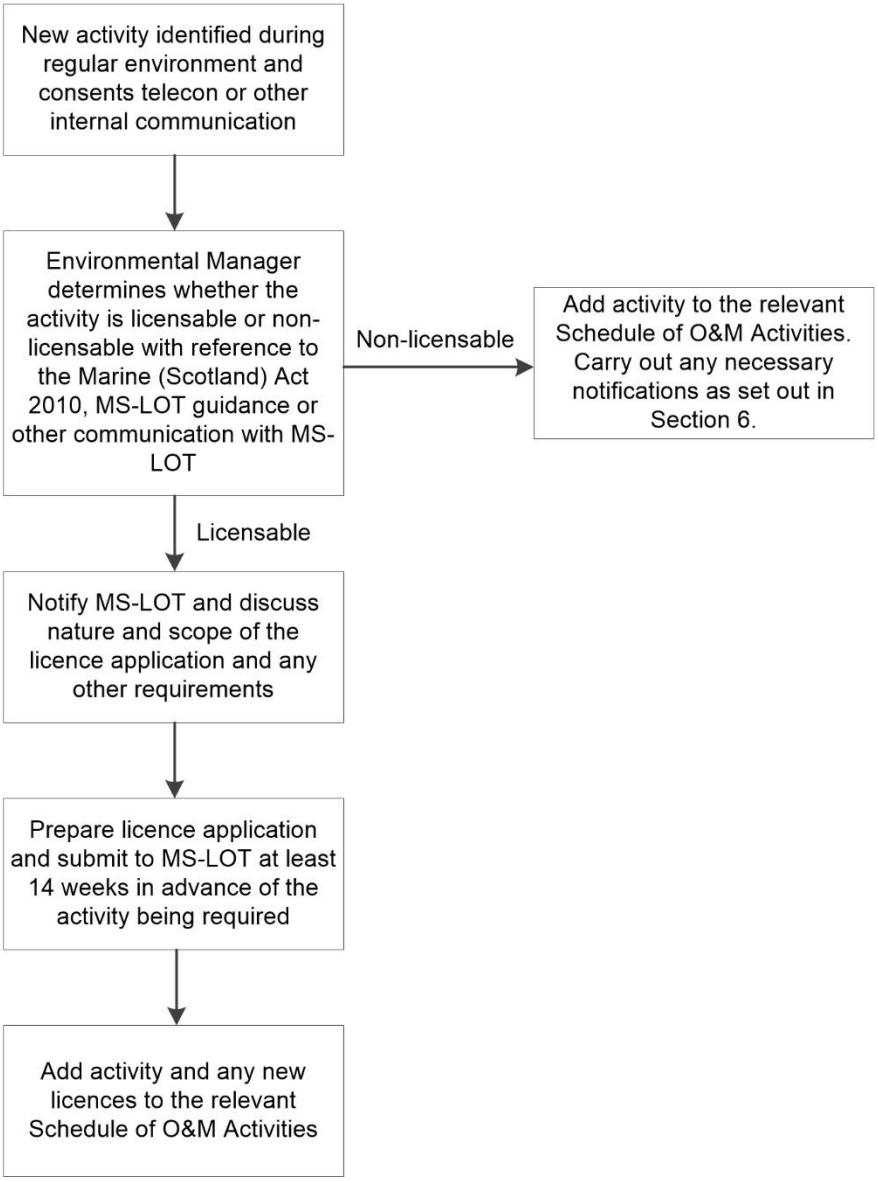
Figure 2: Procedure for Licensing O&M Activities



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6 COMMUNICATIONS AND REPORTING

6.1 Overview

This section sets out the communications and reporting processes associated with the implementation of the O&M Programme. This includes internal communications (e.g. within AOWFL) and external communications (i.e. with MD-LOT and other stakeholders).

6.2 Internal Communications and Reporting

AOWFL hold regular **environment and consents meetings** (generally via conference call). These meetings are led by the ENSU Specialist with attendance by the Consents Manager, Site Manager and H&S Manager. The purpose of these meetings is to discuss upcoming O&M activities (i.e. over the next weeks to months) and longer-term future activities (i.e. over the next 6-12 months) and to identify any environment and consents requirements and actions (see Section 6.3) in relation to these activities. In addition, monthly HSE meetings are attended by the O&M team, including subcontractors and contractors, in order to coordinate HSE activities during the O&M phase.

Contractor/Subcontractor **method statements** will be reviewed by the ENSU Specialist for specific activities and the Consents Manager will cross-check the proposed activities with the Schedule of O&M Activities provided in Section 4 to identify if there are any further licensing requirements. In the event that any additional licences are required, the Consents Manager will follow the procedure set out in Section 5. Contractors/Subcontractors will be provided with copies of the relevant consents and licences and made aware of the consent obligations associated with a particular activity.

The Consents Manager will maintain a log of licensable marine activities carried out at EOWDC including a record of compliance actions.

6.3 External Communications and Reporting

AOWFL will carry out external communications, notifications and reporting in relation to O&M activities in compliance with the requirements of the consent and licence conditions. These requirements are set out in Table 5 in respect of specific consent conditions and Table 6 in relation to commitments set out in the Consent Plans and include: notification of vessels and contractors to MD-LOT, issue of Notices to Mariners, liaison between the Marine Coordinator and the Defence Infrastructure Organisation (DIO)/Ministry of Defence (MOD) in relation to the Black Dog Firing Range, and reporting of spills and dropped objects. These tables will be updated following award of any new Marine Licence to reflect the requirements of the licence conditions.

MD-LOT agreed that these tables are in line with Marine Licence 04309/19/0 and the Consent Plans during meetings on 16th January 2019 and 21st May 2019. It was also agreed that a **bi-annual meeting** would be arranged between AOWFL and MD-LOT to ensure regular review of the approach to O&M phase consents compliance management.

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In the event that any additional licences are required, the Consents Manager will notify MD-LOT following the procedure set out in Section 5.

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Table 5: Reporting and notification requirements specified in Consent Conditions

Topic	Condition	Summary of requirement	Frequency
Vessels, agents, contractors and sub-contractors	Marine Licence Condition 3.1.2	The Licensee must provide, as soon as reasonably practicable in advance of their engagement in any Licensed Marine Activity, the name and function of any vessel, agent, contractor or sub-contractor appointed to engage in the Works. The notification must include the master's name, vessel type, vessel IMO number and vessel owner or operating company. Any changes to the supplied details must be notified to the Licensing Authority, in writing, prior to any vessel(s), agent(s), contractor(s) or sub-contractor(s) engaging in the licensed activities. All agents, contractors, sub-contractors, and vessel operators must abide by the conditions set out in this licence. Only those vessels, agents, contractors or sub-contractors notified to the Licensing Authority are permitted to carry out any part of the Works. The Licensee must satisfy themselves that any such vessels, agents, contractors or sub-contractors is aware of the extent of the Works for which this licence has been granted, the activity, which is licensed, and the terms of the conditions attached to this licence. The Licensee must give a copy of this licence, and any subsequent variations that have been made to this licence in accordance with section 30 of the 2010 Act, ensuring it is read and understood, to the masters of any vessels, agents, contractors or sub-contractors engaged in the Works.	Prior to the vessel engagement in the works.
Chemical Usage	Marine Licence Condition 3.1.6	The Licensee must ensure that all chemicals which are to be utilised in the Works have been approved in writing by the Licensing Authority prior to use. All chemicals utilised in the Works must be selected from the List of Notified Chemicals assessed for use by the offshore oil and gas industry under the Offshore Chemicals Regulations 2002, unless approved in writing by the Licensing Authority.	Prior to chemical use.
Deposits	Marine Licence Condition 3.4.5	The Licensee must provide an Operation and Maintenance Programme to the Licencing Authority within 3 months of the Completion of the Works. Notification must be provided at least 3 months in advance of any subsequent maintenance works where any additional deposits are required. In the event that these works are not assessed in the Application, and are considered by the Licencing Authority as being a material change to the licence, they will require further Marine Licences.	Provide notification at least 3 months in advance of any additional deposits.
HSE Reporting	Section 36	If any serious health and safety incident occurs on the Site requiring the Company	Within 24 hours of an

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Topic	Condition	Summary of requirement	Frequency
	Consent, Condition 5	[AOWFL] to report it to the Health and Safety Executive, then the Company must also notify the Scottish Ministers of the incident within 24 hours of the incident occurring.	incident occurring.

Table 6: Reporting and notification requirements specified in Consent Plans

Topic	Consent Plan	Summary of requirement	Frequency
Liaison between the Marine Coordinator and DIO/MOD	Black Dog Firing Range Management Plan (Section 7.3)	Where possible two months' notice (in the form of an indicative schedule) will be given to the DIO prior to any anticipated entry into the Offshore Danger Area (ODA). The purpose of this is to give the DIO an indicative timeframe as to when vessel entry is required so that Firing Range Schedule can be compared. It is unlikely that precise details (i.e. vessel names) will be available at this stage; however, any known relevant details will be included. It is noted that the need for major maintenance work requiring vessel entry into the ODA may arise unexpectedly. In such a case, notice will be given to the DIO as soon as practicable.	2 months' notice (in the form of indicative schedule) to be provided to the DIO/MOD prior to entry into ODA for maintenance activities.
Liaison between the Marine Coordinator and DIO/MOD	Black Dog Firing Range Management Plan (Section 7.3)	In agreement with and where practicable the DIO will be (through the Marine Coordinator) made aware of indicative timeframes for required vessel entry at least two months in advance. Following on from the indicative time frames, construction or major maintenance vessel entry into the ODA (during both the construction and operational phases of the Development) will require a minimum of one week's notice, which should be given to the Marine Coordinator by the vessel contractor. The information listed below will be provided: • Vessel (s) name and call sign; • Vessel (s) Mobile Maritime Service Information (MMSI) ; • Approx. time/date of entry; • Approx. time/date of exit; • Planned vessel route while within ODA, i.e., anchoring; and • Nature of work to be undertaken. If any changes to submitted entry requirements are required at short notice (e.g., in the event of adverse weather), the vessel contractor must inform the Marine Coordinator as soon as is practicable.	1 weeks' notice provided (incl. vessel details) to be provided to the DIO/MOD prior to entry into ODA for maintenance activities.
Liaison between	Black Dog Firing	In addition to that listed above, all vessels must also make contact with the Marine	Vessels to make contact

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Topic	Consent Plan	Summary of requirement	Frequency
the Marine Coordinator and DIO/MOD	Range Management Plan (Section 7.3)	Coordinator directly one hour prior to entry into the ODA, who will provide verbal confirmation that it is safe to enter. Additionally, as good practice, vessels shall check that there are no red flags or red lights displayed on the shore, which may indicate firing is taking place (see Section 5.2), and verbally confirm as such with the Marine Coordinator.	with Marine Coordinator 1 hour prior to entry.
Local Notice to Mariners (LNtM) Issued upon Commissioning and During Operation	Navigational Safety Plan (Section 9.2.3)	AOWFL will ensure that relevant stakeholders are informed via LNtMs of any planned and unplanned maintenance activities that are outside the day to day maintenance activities associated with the EOWDC.	LNtMs to be issued as per procedure developed during construction phase (for activities outside day to day maintenance).
KIS-ORCA Notifications upon Commissioning and During Operation	Navigational Safety Plan (Section 9.5.3)	AOWFL will ensure notices are issued to the Kingfisher Fortnightly Bulletin detailing any planned or unplanned maintenance activities that are outside the day to day maintenance carried out at the EOWDC.	Kingfisher notices to be issued as per procedure developed during construction phase (for activities outside day to day maintenance).
Reporting during Operation and Maintenance Phase	Vessel Management Plan (Section 10.4)	At present there is no intention to undertake regular reporting in relation to this VMP during the operational stage although records of operations and maintenance vessel movements and activity will be maintained remotely. As noted above any change to vessel details involved in the operation and maintenance of the EOWDC will be notified to the Licensing Authority (including for example vessels proposed for unplanned or exceptional maintenance activities).	Details of vessels, agents, contractors and subcontractors to be provided as per procedure established during construction phase. Any changes to be notified.
Notification of Dropped Objects	Offshore Environmental Management Plan (Section 6.9)	Notification of dropped objects during the construction or operational phase will be completed using the MD-LOT 'Offshore Wind & Marine Renewables Dropped Objects Form' ... This is a recently modified PON2 style process for adoption by the offshore wind farm industry in Scottish waters.	Dropped objects to be reported to Marine Scotland within 6 hours of incident (or within 24 hours if under Force Majeure).
Spills originating from a vessel / WTG	Marine Pollution Contingency Plan (Appendix C)	The Consents Manager will notify MD-LOT of the incident within 24 hours for serious incidents (and 72 hours for less serious incidents).	In event of marine pollution from Vessel or WTG, MD-LOT must be informed within 24 hrs, or 72 hours

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Topic	Consent Plan	Summary of requirement	Frequency
			for less serious incidents.

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6.4 Incident Response and Reporting

The requirements in relation to Incident Response and Reporting and Dropped Objects are provided in Section 6.8 and Section 6.9 respectively of the OEMP. In the event of a marine pollution incident the procedures for response and reporting are provided within the MPCP.

7 REVIEW PROCESS

Whilst this document presents the worst-case scenario for each activity type, it is acknowledged that this programme and associated methodologies may change. AOWFL will therefore undertake a review of this document on an annual basis, in order to ensure that O&M activities on site remain in line with those proposed. Furthermore, should the methodologies proposed within this document materially change AOWFL will review the programme as required and submit details of any material change to MD-LOT. Specifically, in line with consultation response from SEPA (email received 7th January 2020), should chemicals be proposed to be used during marine growth removal, AOWFL will seek prior approval from MD-LOT. This programme will be reviewed should any of the referenced legislation or licences change during the lifetime of the project to ensure they do not affect the contents of this programme.

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8 REFERENCES

AOWFL (2011) European Offshore Wind Deployment Centre Environmental Statement.

AOWFL (2012) European Offshore Wind Deployment Centre Environmental Statement Addendum (SEIS).

AOWFL (2018) Blackdog Firing Range Management Plan (EOWDC Document Reference Number ABE-ENV-DB-0013).

AOWFL (2017) Cable Laying Strategy (EOWDC Document Reference Number ABE-ENV-DB-0003).

AOWFL (2017) Decommissioning Programme (EOWDC Document Reference Number ABE-ENV-BG-0011).

AOWFL (2017) Fisheries Mitigation Strategy, Version 7.

AOWFL (2017) Offshore Environmental Management Plan (EOWDC Document Reference Number ABE-ENV-DB-0012).

AOWFL (2017) Marine Pollution Contingency Plan (EOWDC Document Reference Number ABE-ENV-DB-0004).

AOWFL (2017) Navigational Marking Plan (EOWDC Document Reference: ABE-ENV-BD-0009.

AOWFL (2017) Navigational Safety Plan (EOWDC Document Reference: ABE-ENV-QB-0008).

AOWFL (2017) Vessel Management Plan (EOWDC Document Reference: ABE-ENV-BD-006).

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