



Beatrice Offshore Wind Farm Consent Plan

Project Environmental Monitoring Programme
(Offshore Transmission Assets)

November 2020

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Project Title/ Location	Beatrice Offshore Wind Farm
Project Reference Number	LF000005
Date:	November 2020

Project Environmental Monitoring Programme Offshore Transmission Assets

Pursuant to Offshore Transmission Works Marine Licence

Condition 3.2.1.1

For the approval of the Licensing Authority

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This is a 'living' document. It will be regularly reviewed and updated to reflect the status of the Project Environmental Monitoring Programme. All revisions to this document are tracked in the table immediately below.

Rev	Prepared By	Sign Off	Checked By	Sign Off	ECoW Review By	Sign-Off	Approved By		Date of Issue
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Consent plan overview

Purpose of this PEMP

This Project Environmental Monitoring Programme (PEMP) for the Beatrice Offshore Transmission Assets has been prepared to address specific post-construction and operation and maintenance (O&M) requirements of Marine Licence Condition 3.2.1.1 for the Beatrice Offshore Transmission Works (OfTW).

The overall aim of this PEMP is to outline and define the approach taken to environmental monitoring of potential environmental impacts associated with post-construction and O&M and is designed to provide guidance to those involved in the management of the Offshore Transmission Assets.

Scope of this PEMP

This PEMP includes:

- Summary on the environmental monitoring undertaken for the pre-construction and construction phases of the Beatrice Offshore Wind Farm (building on the detail presented in LF000005-PLN-179 BOWL PEMP Rev 2.0).
- Details the environmental monitoring proposals covering post-construction and O&M on the following (where relevant):
 - > diadromous fish;
 - > benthic communities;
 - > seabed scour and local sediment deposition; and,
 - > marine mammals.
- The objectives and methodologies for the monitoring surveys.
- Evidence of consultation on and approval of monitoring approach and survey methodology.
- Reference to monitoring survey reports, where available.
- The programme for proposed monitoring surveys and reporting.

Structure of this PEMP

This PEMP is structured as follows:

Sections 1 to 4 set out the scope and objectives of this PEMP, provide an overview of the Offshore Transmission Assets, set out statements of compliance and detail the process for making updates and amendments to this document.

Section 5 provides detail on the parties responsible for the implementation and delivery of this PEMP.

Section 6 outlines the structure of the subsequent sections to demonstrate compliance with Marine Licence Condition 3.2.1.1.

Sections 7 to 14 summarise the approach to monitoring for each topic identified in Marine Licence Condition 3.2.1.1. These sections also detail the aims and objectives of the monitoring approach, the approved survey methodology, survey reports and provide a programme of the survey works for each topic.

Section 15 summarises the programme of survey works for each topic identified in Marine Licence Condition 3.2.1.1.

Section 16 details the licensing and legal requirements associated with the PEMP surveys which BOWL will adhere to.

Section 17 demonstrates BOWL's compliance with the monitoring measures proposed in the Application, the Environmental Statement (ES) and the Supplementary Environmental Information Statement (SEIS).

Appendix A details the relevant commitments made in the ES and SEIS and cross references to where this has been or is to be implemented.

Programme audience

This PEMP is intended to summarise the environmental monitoring programme associated with the post-construction and O&M phases of the Beatrice Offshore Wind Farm (Offshore Transmission Assets) for stakeholders and regulators.

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List of abbreviations and definitions

Term	Definition / Description
ADD	Acoustic Deterrent Device.
AGDS	Acoustic Ground Discrimination Sonar.
AC	Alternating Current.
Application	The Application letters and Environmental Statement submitted to the Scottish Ministers by BOWL on 23 April 2012 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by BOWL on 29 May 2013.
ASFB	Association of Salmon Fishery Boards.
BOWL	Beatrice Offshore Windfarm Limited (Company Number SC350248) and having its registered office at Inveralmond House, 200 Dunkeld Road, Perth, PH1 3AQ.
consent	The term used to mean the S36 consent and Marine Licence.
consent conditions	The terms that are imposed on BOWL under the S36 consent or Marine Licence that must be fulfilled throughout the period that the consent is valid.
Consent Plan	Plan requiring approval by Scottish Ministers and as stated within the conditions of the consent.
cMMMP	construction Marine Mammal Monitoring Programme.
dBht	Decibel metric taking into account species hearing sensitivity.
DP	The Decommissioning Programme as required under Condition 3 of the S36 consent and Condition 3.2.2.8 of the Marine Licence.
DNV	Det Norske Veritas.
DSFB	District Salmon Fishery Boards.
DDV	Drop Down Video.
ECC	East Caithness Cliffs [SPA].
EIA	Environmental Impact Assessment.
EPS	European Protected Species.

Term	Definition / Description
ES	The Environmental Statement submitted to the Scottish Ministers by BOWL on 23 April 2012 as part of the Application.
final commissioning	Means the date on which all WTGs have supplied electricity on a commercial basis to the National Grid.
GPS	Global Positioning System.
HRA	Habitats Regulations Assessment.
HV	High Voltage (220kV).
IAC	Inter-array cable. Part of the IAC AC electrical cable network that connect the WTGs to the OTMs.
JNCC	Joint Nature Conservation Committee.
km	kilometre.
kV	kilovolts.
Licencing Authority	the Scottish Ministers.
Licensee	Beatrice Offshore Windfarm Limited, a company registered in Scotland having its registered number as SC350248.
Marine Licence	The written consents granted by the Scottish Ministers (referred to on the licence as the Licensing Authority) under the Marine (Scotland) Act 2010, Part 4. The OfTW Marine Licence was issued on 2 September 2014 (reference: 04461/14/1) and revised by the issue of a licence on 27 April 2016 (reference: 04461/16/0), as subsequently revised and superseded by the licence with reference 04461/18/0 on 9 April 2018, and as subsequently revised and superseded by the licence with reference 04461/18/1 on 25 May 2018.
MMMP	Marine Mammal Monitoring Programme.
MMO	Marine Management Organisation.
MS-LOT	Marine Scotland Licensing and Operations Team.
MSS	Marine Scotland Science.
MHWS	Mean High Water Springs.
MV	Medium Voltage (33kV).
m	metre.

Term	Definition / Description
MFRAG	Moray Firth Regional Advisory Group. A group responsible for overseeing monitoring and mitigation on a regional scale, set up by the Scottish Ministers.
MFRAG-MM	Moray Firth Regional Advisory Group Marine Mammals subgroup.
MORP	Moray Offshore Renewable Power.
NRMSD	National Research and Monitoring Strategy for Diadromous Fish.
OTM	Offshore Transformer Module means an AC offshore substation platform which is a standalone modular unit that utilises the same substructure and foundation design as a WTG.
Offshore Transmission Assets	The Offshore Transmission Assets includes the transmission cable required to connect the wind farm to the onshore transmission works (OnTW). This covers the OTMs and their HV connector cable, and the cable route from the OTMs to the transition joint bays just landward of MHWS at the landfall west of Portgordon on the Moray coast.
OFTO	Offshore Transmission Owner
OfTW	Offshore Transmission Works. The term used during project development and construction to describe the Offshore Transmission Assets.
OfTW lease site	The offshore transmission site upon the bed of the sea at Beatrice under lease with the Crown Estate Scotland.
OnTW	The onshore transmission works landward from the transition joint bays, consisting of onshore buried export cables to the onshore substation and connection to the National Grid network.
O&M	Operation and Maintenance.
OMP	The Operation and Maintenance Programme as required under Condition 17 of the S36 consent and Condition 3.2.3.6 of the Marine Licence.
OEMP	Operational Environmental Management Plan, as required under Condition 15 of the S36 consent and as contained within the OMP.
PSA	particle size analysis.

Term	Definition / Description
PS	The Piling Strategy as required under Condition 12 of the S36 consent.
PCoD	Population Consequences of Disturbance model.
PEMP	The Project Environmental Monitoring Programme as required under Condition 27 of S36 consent.
PAD	The Protocol for Archaeological Discoveries as required under Condition 37 of the S36 consent.
ROV	Remotely Operated Vehicle.
RSPB Scotland	Royal Society for the Protection of Birds Scotland.
S36 consent	The written consent granted by the Scottish Ministers under Section 36 and Section 36A of the Electricity Act 1989, on 19 March 2014.
SAC	Special Area of Conservation, protected sites classified in accordance with Article 3 of the EC Habitats Directive.
SCENE	Glasgow University Scottish Centre for Ecology & the Natural Environment.
ScotMER	Scottish Marine Energy Research (formerly SSMEG)
SEIS	The Supplementary Environmental Information Statement submitted to the Scottish Ministers by BOWL on 29 May 2013 as part of the Application.
SMRU	Sea Mammal Research Unit.
SNH	Scottish Natural Heritage.
Soft start	The gradual increase of piling power, incrementally over a set time period, until full operational power is achieved.
SPA	Special Protection Area, protected sites classified in accordance with Article 4 of the European Commission Birds Directive.
SSMEG	Scottish Strategic Marine Environment Group. A group yet to be formed, responsible for overseeing monitoring and mitigation on a national scale, set up by the Scottish Ministers.
TRRMP	The Television and Radio Reception Mitigation Plan as required under Condition 26 of the S36 consent.
UXO	unexploded ordnance.

Term	Definition / Description
UoA	University of Aberdeen.
WDC	Whale and Dolphin Conservation.
Wind Farm Assets	The offshore array development as assessed in the ES including the WTGs, their foundations, and the IACs.
Wind Farm CaP	The Wind Farm Cable Plan as required under Condition 19 of the S36 consent
WP	Work Package.
WSI	Written Scheme of Investigation, which establishes the mitigation procedures that must be followed in order to avoid damage to cultural heritage assets and targets of archaeological potential.
WTG	Wind Turbine Generator.

1 Introduction

1.1 Background

- 1.1.1 The Beatrice Offshore Wind Limited (BOWL) was granted a Marine Licence from the Scottish Ministers (Ref.1), dated 02 September 2014 (the Marine Licence) and revised in 2016 (Ref.2), 2018 (Ref.3) and most recently revised by the issue of licence 04461/18/1 (Ref.4) on 25 May 2018. In combination these approvals are referred to as 'the consent'.

1.2 Objectives of this Project Environmental Monitoring Programme

- 1.2.1 The purpose of this Offshore Transmission Assets Project Environmental Monitoring Programme (PEMP) is to provide the over-arching framework by which the environmental effects, in the vicinity of the Beatrice Offshore Wind Farm, will be monitored throughout the post-construction and operations and maintenance (O&M) phases (excluding decommissioning) of the Offshore Transmission Assets. A separate PEMP (Ref.5) has been prepared to cover the post-construction and O&M phases (excluding decommissioning) of the Beatrice Offshore Wind Farm Assets.
- 1.2.2 This PEMP supersedes the overarching, development-wide (i.e. both wind farm and transmission assets) PEMP (Ref.6) which was approved by Licensing Authority on 02 August 2016. This approval confirmed that the implementation of the PEMP Revision 1.1 satisfied the requirements of Marine Licence Condition 3.2.1.1 in regard to the pre-construction monitoring programme, and in this respect the condition was discharged.
- 1.2.3 This PEMP, together with the Wind Farm Assets PEMP (Ref.5), supersede the overarching PEMP and are required to be submitted on account that ownership of the offshore transmission and wind farm assets will be split, marine licenses reassigned to respective owners and thus responsibility for the implementation of the respective PEMPs will reside with the respective owners.
- 1.2.4 This PEMP summarises the programme of environmental monitoring that BOWL intends to undertake (during O&M) or has already undertaken (pre-construction and/or construction) in relation to the Offshore Transmission Assets and provides cross-references, where relevant, to detailed method statements and any monitoring reports completed to date.
- 1.2.5 It should be noted that method statements and monitoring reports have been subject to prior, separate consultation and approval by relevant statutory bodies and stakeholders, including discussion and agreement at the Moray Firth Regional Advisory Group (MFRAG), and the MFRAG marine mammal and ornithology subgroups where appropriate.

Table 1.1: Consent conditions to be discharged by this PEMP.

Consent reference	Condition text	PEMP reference
Marine Licence Condition 3.2.1.1	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a PEMP, in writing, to the Licensing Authority for their written approval.	PEMP Rev 1.1 was approved by the Licensing Authority on 02 August 2016.
	Such approval may only be granted following consultation by the Licensing Authority with the Joint Nature Conservation Committee ("JNCC"), Scottish Natural Heritage ("SNH"), Whale and Dolphin Conservation ("WDC"), the Association of Salmon Fishery Boards ("ASFB") and any other ecological advisors as required at the discretion of the Licensing Authority.	PEMP Rev 1.1 was approved, following consultation, by the Licensing Authority on 02 August 2016.
	The PEMP must be in accordance with the Application as it relates to environmental monitoring.	Appendix A.
	The PEMP must set out measures by which the Licensee must monitor the environmental impacts of the Works. Monitoring is required throughout the lifespan of the Works where this is deemed necessary by the Licensing Authority and specifically, monitoring for cable exposure as specified in condition 3.2.2.10 parts e and f. Lifespan in this context includes pre-construction, construction, operational and decommissioning phases.	Sections 7 to 10. This PEMP focuses on the operational phase. This PEMP excludes decommissioning.
	Monitoring should be done in such a way as to ensure that the data which is collected allows useful and valid comparisons as between different phases of the Works.	Section 6 to 10.
	Monitoring may also serve the purpose of verifying key predictions in the Application.	Section 6 to 10.
	Additional monitoring may be required in the event that further potential adverse environmental effects are identified for which no predictions were made in the Application. The Licensing Authority may agree that monitoring may cease before the end of the lifespan of the Works.	Section 6 to 10.

Consent reference	Condition text	PEMP reference
	The PEMP must cover, but not be limited to the following matters: a) Pre-construction, construction (if considered appropriate by the Licensing Authority) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for: 1. Diadromous fish; 2. Benthic communities; and 3. Seabed scour and local sediment deposition. b) The participation by the Licensee in surveys to be carried out in relation to marine mammals as set out in the Marine Mammal Monitoring Programme.	Section 6 to 10. This PEMP focuses on the operational phase. This PEMP excludes decommissioning.
	All the initial methodologies for the above monitoring must be approved, in writing, by the Licensing Authority and, where appropriate, in consultation with the Moray Firth Regional Advisory Group ("MFRAG"), referred to in conditions 3.2.2.18 and 3.2.3.10 of this licence.	Section 6 to 10.
	Any pre-consent surveys carried out by Licensee to address any of the above species may be used in part to discharge this condition.	Section 6 to 10.
	The PEMP is a live document and must be regularly reviewed by the Licensing Authority, at timescales to be determined by the Licensing Authority, in consultation with the MFRAG to identify the appropriateness of on-going monitoring. Following such reviews, the Licensing Authority may, in consultation with the MFRAG, require the Licensee to amend the PEMP and submit such an amended PEMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation with MFRAG and any other ecological, or such other advisors as may be required at the discretion of the Licensing Authority. The PEMP, as amended from time to time, must be fully implemented by the Licensee at all times.	Section 3.
	The Licensee must submit written reports of such monitoring surveys to the Licensing Authority at timescales to be determined by the Licensing Authority in consultation with the MFRAG. Subject to any legal restrictions regarding the treatment of the information, the results are to be made publicly available by the Licensing Authority, or by such other party appointed at their discretion.	Sections 7 to 10.

1.2.6 In addition to the specific consent requirements for a PEMP and the requirements thereof (as set out in Table 1.1), this PEMP also includes information in respect of a number of other conditions within the Marine Licence which are linked to the matter of post-construction and O&M phase environmental monitoring; these are set out in Table 1.2 and references to where matters are addressed in this PEMP are given.

Table 1.2: Other consent conditions relevant to this PEMP.

Consent reference	Summary of condition	PEMP reference
Marine Licence Condition 3.2.2.5	The Piling Strategy (PS) must include: c) Details of mitigation and monitoring to be employed during pile-driving, as agreed by the Licensing Authority.	Sections 7 to 10.
Marine Licence Condition 3.2.2.10	The Cable Plan (CaP) must include the following: b) The results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing.	Section 8.
Marine Licence Conditions 3.2.2.18 and 3.2.3.10	Participation in Moray Firth Regional Advisory Group (MFRAG) The Licensee must participate in any MFRAG established by the Licensing Authority for the purpose of advising the Licensing Authority on research, monitoring and mitigation programmes for, but not limited to, diadromous fish, marine mammals and commercial fish. Should a Scottish Strategic Marine Environmental Group ("SSMEG") be established (refer to condition 3.2.2.19 and 3.2.3.11), the responsibilities and obligations being delivered by the MFRAG will be subsumed by the SSMEG at a timescale to be determined by the Licensing Authority.	Section 7 to 10.
Marine Licence Conditions 3.2.2.19 and 3.2.3.11	Participation in Scottish Strategic Marine Environment Group (SSMEG) The Licensee must participate in any SSMEG established by the Licensing Authority for the purposes of advising the Licensing Authority on research, monitoring and mitigation programmes for, but not limited to, diadromous fish, marine mammals and commercial fish.	Section 7.
Marine Licence Condition 3.2.1.3	Participation in Atlantic salmon, sea trout and European eel Monitoring Strategy The Licensee must, to the satisfaction of the Licensing Authority, participate in the monitoring requirements as laid out in the 'Scottish Atlantic Salmon, Sea Trout and European Eel Monitoring Strategy' so far as they apply at a local level (the Moray Firth). The extent and nature of the Licensee's participation is to be agreed by the Licensing Authority in consultation with the MFRAG.	Section 7

1.3 Linkages with other Consent Plans

- 1.3.1 This PEMP sets out the proposed framework for the monitoring of each topic identified in the Marine Licence Condition 3.2.1.1. In addition, Marine Licence Condition 3.2.3.2 requires an Operation and Maintenance Programme (OMP) to be submitted to the Licensing Authority that is, so far as is reasonably practicable, informed by and/or consistent with this PEMP.
- 1.3.2 The OMP (Offshore Transmission Assets) revision 1.0 (Ref.7) was approved by Licensing Authority on 03 July 2018. This PEMP forms a suite of documents, including the OMP that are active following final commissioning.
- 1.3.3 The linkages between this PEMP and other operational Consent Plans are summarised in Table 1.3. It should be noted that other relevant Consent Plans are cross-referenced as appropriate in this PEMP but the detail from those other plans is not repeated here.

Table 1.3: Linkages between the PEMP and other operational Consent Plans.

Other operational Consent Plans	Consistency with and linkage to PEMP
PEMP (Wind Farm Assets) (Ref.5)	The purpose of the PEMP (as required under Section 36 (S36) consent Condition 27) is to provide the over-arching framework by which the environmental effects, in the vicinity of the Wind Farm Assets, will be monitored throughout their operational lifetime (excluding decommissioning). The PEMP (Wind Farm Assets) must align and run in parallel with (unless otherwise agreed with Licensing Authority) this PEMP.
OMP (Offshore Transmission Assets) (including the Operational Environmental Management Plan (OEMP)) (Ref.7)	The OMP sets out an intended programme of O&M activities in relation to the Offshore Transmission Assets. The OMP forms a single-source document that contains operational commitments relating to: a. vessel management; b. navigational safety; c. inter-array cabling; d. lighting and marking; e. traffic and transport; f. commercial fisheries; and g. marine pollution contingency planning. The OMP also includes the OEMP (as required under Marine Licence Condition 3.2.1.2) which sets out the over-arching environmental management framework for the Offshore Transmission Assets during their operation. The OMP considers known environmental sensitivities taking into account the results of ongoing monitoring as detailed within this PEMP. The OMP must be informed by surveys and monitoring undertaken as part of this PEMP.

Other operational Consent Plans	Consistency with and linkage to PEMP
Archaeology Written Scheme of Investigation (WSI) and Procedures for Archaeological Discoveries (PAD) (Beatrice Offshore Transmission System) (Ref.8)	The WSI sets out the mitigation procedures that must be followed in order to seek to avoid damage to cultural heritage assets and targets of archaeological potential. The PAD sets out the protocols and procedures that must be followed in the event of any unexpected archaeological discoveries whilst undertaking O&M activities.
Decommissioning Programme (DP) (Offshore Transmission Assets) (Ref.9)	Sets out the strategy for decommissioning the Offshore Transmission Assets at the end of the operational lifecycle.

1.4 PEMP document structure

1.4.1 In response to the specific requirements of the Marine Licence, this PEMP has been structured so as to be clear that each part of the specific requirements have been met and that the relevant information, to allow the Licensing Authority to approve the PEMP, has been provided. The document structure is set out in Table 1.4.

Table 1.4: PEMP document structure.

Section	Title	Overview
1	Introduction	Background to consent requirements and overview of the PEMP scope and structure; and Identifies those other Consent Plans relevant to the environmental monitoring process and details the relationship between the PEMP and those plans.
2	Statements of compliance	Sets out the statements of compliance in relation to the consent.
3	Updates and amendments to this PEMP	Sets out the procedures for any required updating to or amending of the approved PEMP and subsequent further approval by the Licensing Authority.
4	Offshore Transmission Assets	Provides an overview of the Offshore Transmission Assets.
5	PEMP roles and responsibilities	Provides information on the roles and responsibilities of BOWL and other parties in the implementation and delivery of the PEMP.
6	Environmental monitoring programme	Sets out the approach to developing monitoring strategies for each of the topics identified in the Marine Licence.

Section	Title	Overview
7	Diadromous fish	Summarises the monitoring strategy and results in respect of migratory fish species.
8	Benthic communities	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of benthic communities.
9	Seabed scour and local sediment deposition	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of seabed scour and local sediment deposition.
10	Marine mammals	Summarises the monitoring strategy and programme (and any subsequent surveys) in respect of marine mammals.
11	Programme of survey works	Summarises the monitoring programme for all environmental topics.
12	Licences and legal requirements	Sets out the licences that must be sought and legal requirements associated with delivering the PEMP.
13	Compliance with the Application, ES and SEIS	Demonstrates that the programme of monitoring set out in this PEMP is consistent with that proposed in the ES and SEIS.

2 Statements of compliance

2.1 Introduction

- 2.1.1 This section is intended to re-affirm the commitment to ensuring that the Beatrice Offshore Wind Farm is monitored in such a manner as to meet the relevant requirements set out by the consents but also broader legislative requirements.

2.2 Statements of compliance

- 2.2.1 BOWL in instructing environmental monitoring will require compliance with this PEMP as approved by the Licensing Authority (and as updated or amended from time to time following the procedure set out in Section 3 of this PEMP).
- 2.2.2 Where updates or amendments are required to this PEMP, BOWL will require the Licensing Authority are informed as soon as reasonably practicable and where necessary the PEMP will be updated or amended (see Section 3 below).
- 2.2.3 BOWL in undertaking environmental monitoring will require compliance with other, relevant Consent Plans as approved by the Licensing Authority, as set out in Section 1.3 above.
- 2.2.4 BOWL in undertaking environmental monitoring will require compliance with the environmental monitoring commitments set out in the original Application and the Environmental Statement (ES) and Supplementary Environmental Information Statement (SEIS) except in so far as amended by the terms of the Marine Licence (unless otherwise approved by the Licensing Authority) (see Section 13 and Appendix A).
- 2.2.5 BOWL will, in instructing environmental monitoring, require compliance with all other relevant legislation and require that all necessary licences and permissions are obtained.
- 2.2.6 BOWL have committed to participating in MFRAG, including any relevant subgroups, and SSMEG (now ScotMER).

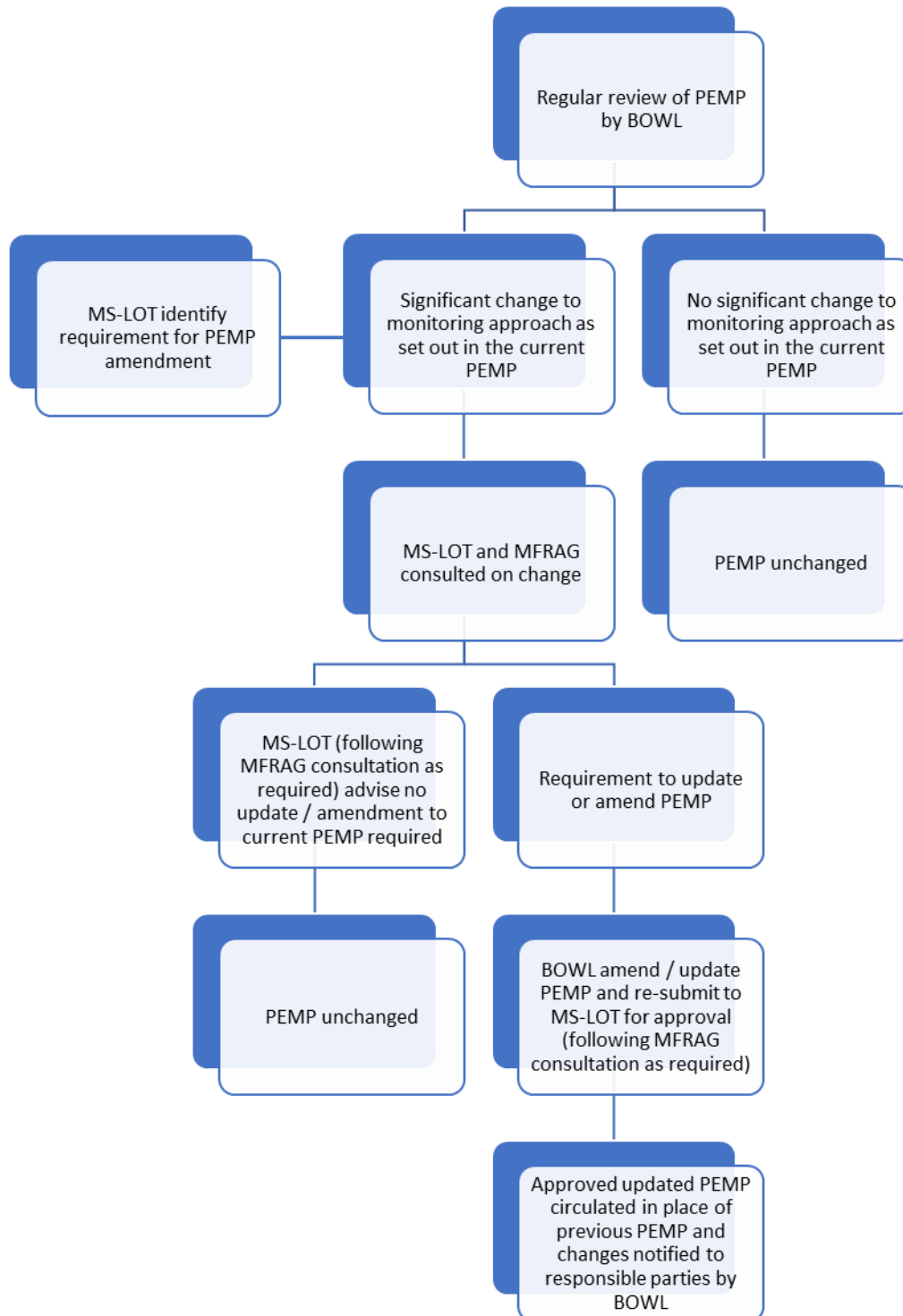
3 Updates and amendments to this PEMP

- 3.1.1 Marine Licence Condition 3.2.1.1 recognises that updates or amendments to this PEMP may be required, stating that:

The PEMP is a live document and must be regularly reviewed by the Licensing Authority, at timescales to be determined by the Licensing Authority, in consultation with the MFRAG to identify the appropriateness of on-going monitoring. Following such reviews, the Licensing Authority may, in consultation with the MFRAG, require the Licensee to amend the PEMP and submit such an amended PEMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation with MFRAG and any other ecological, or such other advisors as may be required at the discretion of the Licensing Authority. The PEMP, as amended from time to time, must be fully implemented by the Licensee at all times.

- 3.1.2 Where it is necessary to update this PEMP in light of significant new information, or upon notification by the Licensing Authority, the change management process, as set out in Figure 3.1, will be used to identify such information, communicate changes to the Licensing Authority, update the PEMP, seek further approval of amendments or updates (in consultation with MFRAG or such other advisors as may be required by the Licensing Authority), and disseminate the updated version of the PEMP.

Figure 3.1. PEMP change management procedure.



4 Overview of the Offshore Transmission Assets

4.1 Introduction

4.1.1 Figure 4.1 shows the boundaries of the wind farm lease site and the OfTW lease site within which the Wind Farm Assets and the Offshore Transmission Assets are located.

4.2 Offshore Transmission Assets

4.2.1 The Offshore Transmission Assets associated with the Beatrice Offshore Wind Farm consists of the following main components:

- two jacket substructures each installed on four pile foundations driven into the seabed;
- two Alternating Current (AC) substation platforms, referred to as Offshore Transformer Modules (OTMs), collecting the generated electricity and transforming the electricity from 33 kilovolts (kV) to 220kV for transmission to shore. The OTMs are connected to the Wind Turbine Generators (WTGs) via inter-array cables (IACs)¹;
- two high voltage (HV) AC subsea export cables, buried or mechanically protected (in areas where burial was not possible), transmitting the electricity from the OTMs to the land fall just west of Portgordon on the Moray coast; and
- one HV interconnector cable linking the OTMs to one another.

4.2.2 At the transition joint bays, located landward of mean high water springs (MHWS), the Offshore Transmission Assets become part of the onshore transmission works (OnTW) which consist of the buried transmission cables, the onshore substation and the connection to the National Grid network. These assets do not form part the offshore assets and therefore do not fall under the scope of this document.

¹ There is a total of 91 IACs arranged in fourteen circuits (also referred to as strings) with six WTGs per string (84 WTGs in total) and these form part of the Wind Farm Assets.

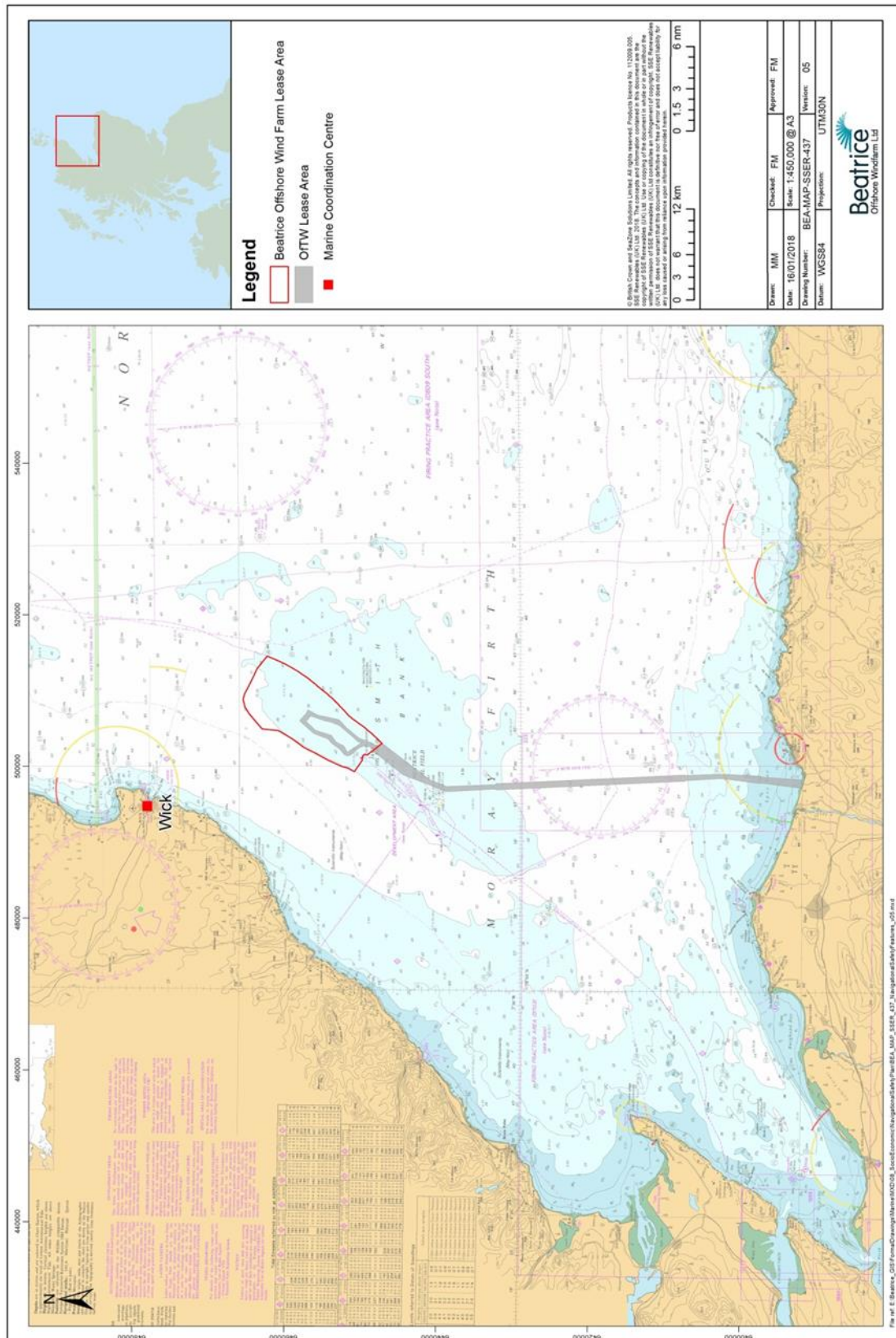


Figure 4.1: Location of the wind farm lease site and OTW lease site

5 PEMP roles and responsibilities

5.1 BOWL

5.1.1 BOWL will have overall responsibility for the following:

- Maintaining and updating the PEMP document, in consultation with and as required by the relevant authorities;
- Requiring that all environmental monitoring or specialist studies required under the PEMP are undertaken at the appropriate time;
- Reviewing the monitoring reports and submitting the reports to either MFRAG or the appropriate subgroup for consultation before submission to the Licensing Authority; and
- Liaising with the relevant consultees, including the MFRAG, on matters related to this PEMP.

5.2 Ecological survey contractors

5.2.1 BOWL have engaged specialist survey contractors to input to the design of the monitoring programme and undertake monitoring surveys, as required. Table 5.1 details the contractors currently involved in the delivery of the proposed monitoring for each receptor group.

Table 5.1: Specialist contractors who have been or are currently involved in the delivery of monitoring surveys.

Receptor	Specialist contractor
Diadromous fish	Glasgow University Scottish Centre for Ecology & the Natural Environment (SCENE)
Benthic communities	RPS / APEM Ltd
Seabed scour and local sediment deposition	ISurvey and Tideway on behalf of Nexans Fugro
Marine mammals	Aberdeen University, Lighthouse Research Station / RPS

6 Environmental monitoring programme

6.1 Introduction

6.1.1 This section of the PEMP summarises the approach to monitoring for each topic identified in the Marine Licence (See Section 1).

6.1.2 This PEMP document is not intended to present the detail of the monitoring proposals, but rather to summarise the agreed approach to environmental monitoring. Where separate detailed monitoring strategy documents or technical survey reports are available, reference to these is made and a brief summary is provided.

6.1.3 In line with the rationale for post-consent monitoring presented in the Marine Management Organisation's (MMO's) strategic review of offshore wind farm environmental monitoring (Ref.10), the monitoring proposals set out in this PEMP aim to:

- Validate, or reduce uncertainty in predictions on environmental impacts recorded in supporting Environmental Impact Assessments (EIAs) and Habitats Regulations Assessments (HRAs);
- Provide evidence on the effectiveness of mitigation measures; and
- Allow identification of any unforeseen impacts.

6.1.4 The Marine Licence requires BOWL to undertake and/or participate in strategic, regional and project-specific monitoring. Whilst the focus of the PEMP is on specific monitoring, under each topic heading in Sections 7 to 10, commitments to participate in regional and strategic monitoring are also captured where relevant.

6.1.5 Under each monitoring topic heading, the following structure is followed:

- Consent conditions;
- Approach to monitoring;
- Aims and objectives;
- Methodology;
- Reporting; and
- Programme.

7 Diadromous fish

7.1 Introduction

7.1.1 BOWL committed to participate in the National Research and Monitoring Strategy for Diadromous Fish (NRMSD) through undertaking a pre-construction Atlantic salmon smolt tracking study. The completed study has provided information to support better understanding of natural migration pathways and behaviour of smolts in the Moray Firth.

7.2 Consent conditions

7.2.1 Consent conditions relevant to diadromous fish monitoring are summarised in Table 11.1 below.

Table 7.1. Consent conditions requiring monitoring of diadromous fish.

Consent reference	Summary of condition	Discharge status
Marine Licence Condition 3.2.1.1.a.1	The PEMP must cover, but not be limited to the following matters: a) Pre-construction, construction (if considered appropriate by the Licensing Authority) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for: 1. Diadromous fish;	Pre-construction: Pre-construction element of condition discharged by MS-LOT (29/01/2016) (Ref.11).
		Construction: MS-LOT have confirmed that the construction element of Condition 3.2.1.1 does not apply (02/08/2017) (Ref.12).
		Post-construction: MS-LOT have confirmed that the post-construction element of Condition 3.2.1.1 does not apply (02/08/2017) (Ref.12).

Consent reference	Summary of condition	Discharge status
Marine Licence Condition 3.2.1.3	The Licensee must, to the satisfaction of the Licensing Authority, participate in the monitoring requirements as laid out in the 'Scottish Atlantic Salmon, Sea Trout and European Eel Monitoring Strategy' so far as they apply at a local level (the Moray Firth). The extent and nature of the Licensee's participation is to be agreed by the Licensing Authority in consultation with the MFRAG.	Smolt tracking survey methodology approved. Condition discharged by MS-LOT (29/01/2016) (Ref.11)
Marine Licence Condition 3.2.2.18	The Licensee must participate in any MFRAG established by the Licensing Authority for the purpose of advising the Licensing Authority on research, monitoring and mitigation programmes for diadromous fish.	MFRAG acceptance of pre-construction survey methodology confirmed (18/01/2016) (Ref.13).

7.3 Approach to monitoring

- 7.3.1 BOWL appointed SCENE (University of Glasgow) to advise on the scope of and undertake an Atlantic salmon smolt tracking study.
- 7.3.2 The approach to the pre-construction study was developed in discussion with MFRAG and MSS as summarised in Table 11.2 below.
- 7.3.3 BOWL do not propose to undertake any post construction monitoring for diadromous fish.

Table 7.2. Summary of key consultation meetings and agreements for diadromous fish monitoring.

Date	Summary of key discussions and agreements
12/09/2014	Meeting with MSS, MS-LOT to discuss BOWL participation in Pentland Salmon Initiative to achieve required monitoring (Ref.14). This study was not taken forward.
26/06/2015	BOWL issued a briefing note including proposed methodology for smolt tracking in the Cromarty Firth for discussion with MSS (Ref.15).
03/07/2014	Meeting with MSS at Battleby. MSS requested that BOWL enhance marine tracking element of proposed study (Ref.16).
26/08/2015	BOWL issued a revised scope including a greater tracking element to MSS (Ref.17).
28/08/2015	Meeting with local District Salmon Fishery Boards (DSFB) who provided support for the study proposal (Ref.18).
23/09/2015	Letter issued to MSS requesting acceptance of proposed Cromarty Firth smolt tracking study methodology (Ref.19).
07/10/2015	MSS letter confirming acceptance of Cromarty Firth smolt tracking study (Ref. 20).
02/11/2015	Cromarty Firth smolt tracking study methodology issued for acceptance by MFRAG (Ref.21).
18/01/2016	MFRAG accept the proposed methodology for smolt tracking survey (Ref.13)
29/01/2016	MS-LOT letter confirming discharge of OfTW Marine Licence condition 3.2.1.3 as set out in Table 11.1 (Ref.11).
23/02/2017	Meeting with local DSFB to present the results of the Cromarty Firth smolt tracking study (Ref.22).
04/04/2017	BOWL issued the Cromarty smolt tracking final report to MS-LOT (Ref.23 and Ref.24).

7.3.4 The study was designed to track the seawards migration of Atlantic salmon smolts through the Cromarty Firth and into the Moray Firth. The study was designed to align with the research requirements of NRMSD.

7.3.5 The data collected during this monitoring programme has increased the understanding of the speed and pathway of migrating Atlantic salmon smolts and their mortality during the early stages of migration. The study has provided information on the direction preferences displayed by smolts as they leave the Cromarty Firth and their behavioural responses to the tidal and residual flows during migration. This data, together with other studies on smolt migration, build upon the understanding of Atlantic salmon smolt behaviour in Scottish waters.

7.4 Aims and objectives

- 7.4.1 The overall aim of the proposed monitoring programme was to increase the knowledge base of the behaviour of Atlantic salmon in the Moray Firth and to contribute to the NRMSD.

7.5 Methodology

- 7.5.1 The smolt tracking study involved the capture and tagging of smolts as they commenced their seawards migration from a tributary of the River Conon. The smolts' passage past acoustic receiver arrays in the Cromarty Firth was recorded. MSS deployed an additional array of acoustic receivers in the Moray Firth, which further added to the outcome of the study. Attempts were made to actively track a small number of smolts from a small boat, however the combination of background noise levels, tidal and wind conditions and fish behaviour prevented any meaningful data collection. Details of the survey methods employed during the pre-construction smolt tracking surveys were provided in the document 'Cromarty Firth Smolt Tracking Study' (Ref.21) and approved by MFRAG on 18 January 2016.

7.6 Reporting

- 7.6.1 The final survey report entitled 'Atlantic salmon, *Salmo salar*, smolt movements in the Cromarty and Moray Firths' (Ref.23) was completed in 2017. This study is the first to identify the migration direction and swimming depths of downstream migrating Atlantic salmon in both estuarine and marine environments in Scotland. The results of the study suggest that smolts initially migrate in an eastwards direction from the Cromarty Firth rather than in a more northerly direction close to the coast as hypothesised.
- 7.6.2 The survey report was accepted by MSS and was issued to MS-LOT on 04 April 2017 (Ref.24). The report demonstrated the full implementation of the agreed study methodology as required by MS-LOT in respect of the full discharge of Marine Licence Conditions 3.2.1.1 and 3.2.1.3 as they relate to diadromous fish (Ref.11 and Ref.12).

7.7 Programme

- 7.7.1 The programme of monitoring for diadromous fish is set out in Table 11.3.

Table 7.3. Summary of diadromous fish monitoring programme.

Pre-construction	Construction	Post-construction
Pre-construction survey completed in spring 2016.	Not required.	Not required.

8 Benthic communities

8.1 Introduction

8.1.1 BOWL have committed to undertake pre- and post-construction benthic surveys to better understand the recovery rates of benthic communities in the vicinity of the OfTW to validate assumptions made within the ES and SEIS.

8.2 Consent conditions

8.2.1 Consent conditions relevant to benthic monitoring are summarised in Table 12.1 below.

Table 8.1. Consent conditions requiring monitoring of benthic communities.

Consent reference	Summary of condition	Discharge status
Marine Licence Condition 3.2.1.1.a.2	The PEMP must cover, but not be limited to the following matters: a) Pre-construction, construction (if considered appropriate by the Licensing Authority) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for: 2. Benthic communities;	Pre-construction: Pre-construction element of condition discharged by MS-LOT (02/08/2016) (Ref.12).
		Construction: MS-LOT have confirmed that the construction element of Condition 3.2.1.1.a.2 does not apply (02/08/2017) (Ref.12).
		Post-construction: MS-LOT have confirmed that completion of the post-construction surveys as set out in the benthic post construction survey strategy report (Ref.25) will discharge the post-construction element of Condition 3.2.1.1.a.2 (02/08/2016) (Ref.12). BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Condition 3.2.1.1.a.2 at the appropriate time.
Marine Licence Condition 3.2.2.10.b	The Licensee must submit a CaP that includes the results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing.	Pre-construction surveys of the OfTW area were completed in 2015. Survey results were used to inform the OfTW Cable Plan (CaP) (Ref.26) which was approved by MS-LOT on the (23/01/2017) (Ref.27).

8.3 Approach to monitoring

8.3.1 BOWL appointed RPS to advise on the scope and methodology for benthic monitoring

surveys. APEM Ltd. were appointed to undertake the pre-construction monitoring surveys for the OfTW area

8.3.2 BOWL completed pre-construction benthic surveys within the OfTW area during June 2015 to establish baseline conditions for comparison against the results of post-construction surveys to validate predictions made regarding potential impacts on benthic habitats and their subsequent recovery. It should be noted that no further benthic monitoring in the OfTW cable corridor is proposed due to the predicted limited impact on- and rapid rate of recovery of- the benthic communities as set out in the 'Pre-construction Annex 1 habitat survey report' (Ref.28).

8.3.3 The approach to benthic monitoring was presented to and discussed with MS-LOT, MSS, SNH and JNCC and confirmed in subsequent meetings and correspondence (Table 12.2).

8.2. Summary of key consultation meeting and agreements for benthic monitoring.

Date	Summary of key discussions and agreements
19/01/2015	Meeting to present and discuss the scope of pre-construction benthic surveys. Attended by MS-LOT, MSS, SNH and JNCC (Ref.29).
09/04/2015	BOWL response to MSS post-meeting comments regarding benthic survey strategy (Ref.30).
11/05/2015	MFRAG meeting to discuss benthic post-construction monitoring and scope of monitoring (Ref.31).
18/06/2015	BOWL confirmation to MSS and MS-LOT of pre-construction benthic grab sample locations (Email from BOWL to MSS and MS-LOT) (Ref.32).
14/12/2015	BOWL 'Pre-construction Annex 1 habitat survey report for the OfTW corridor' completed (Ref.28).
17/12/2015	BOWL issue pre-construction survey reports and benthic post-construction survey strategy report to MSS for acceptance (Ref.33 and Ref.25).
25/01/2016	MSS accepted benthic survey reports (Ref.34).
21/03/2016	MSS confirm acceptance of the survey report and the proposed post-construction monitoring strategy (Ref.35).
02/08/2016	MS-LOT confirm acceptance of the PEMP and confirm discharge of the pre-construction elements of the Marine Licence Condition 3.2.1.1 (Ref.12).
23/01/2017	MS-LOT confirm acceptance and approval of the OfTW CaP (Ref.26 and Ref.27).

8.4 Aims and objectives

8.4.1 The aims and objectives of the proposed benthic monitoring surveys were to characterise the benthic communities within the OfTW area and establish the pre-construction baseline against which post-construction monitoring could be compared to validate the predictions made within the ES and SEIS.

- 8.4.2 The benthic surveys completed within the OfTW area focused on the identification of any Annex 1 cobble reef habitat present and, if present, delineate their extent in order to inform the export cable routing options and to confirm if Annex 1 submarine structures made by leaking gases are present in association with the pock marks identified within the OfTW area.

8.5 Methodology

- 8.5.1 Methods employed for the pre-construction benthic surveys involved Drop Down Video (DDV) (underwater camera) photography to assess the location and extent of potential Annex 1 habitats. Full details of the methodology used for the pre-construction benthic surveys are outlined in report 'Pre-construction Annex 1 Habitat survey' (Ref.28).
- 8.5.2 Post-construction surveys for benthic habitats within the OfTW area, as required by Marine Licence Condition 3.2.1.1, are not deemed necessary due to the limited impact and the expected rapid recovery of disturbed habitats.

8.6 Reporting

- 8.6.1 The 'Pre-construction Annex 1 Habitat Survey' (Ref.28) report has been issued and accepted by MSS as set out in Table 12.2.
- 8.6.2 The BOWL benthic post-construction survey strategy report (Ref.25) has been issued to and accepted by MSS. The strategy document confirmed that no further monitoring would be required in respect of the OfTW area.

8.7 Programme

- 8.7.1 Details of the benthic monitoring survey programme are summarised at Table 12.3.

Table 8.3. Summary of benthic community monitoring programme.

Pre-construction	Construction	Post-construction
2015 surveys completed. Pre-construction monitoring complete.	No surveys required.	No surveys required.

9 Seabed scour and local sediment deposition

9.1 Introduction

9.1.1 BOWL considers that seabed scour and local sediment deposition is an engineering issue and is not specifically linked to a sensitive environmental receptor. The MMO have undertaken a review of post-consent offshore wind farm monitoring (Ref.10). This report noted that monitoring of scour should only be required in relation to the structural integrity of foundations or other associated infrastructure over the lifetime of an offshore wind farm project. This section of the PEMP is therefore informed by proposed seabed surveys required for engineering purposes for the pre-construction, post installation and post-construction phases.

9.2 Consent conditions

9.2.1 Consent conditions relevant to seabed scour and local sediment deposition monitoring are summarised in Table 13.1

Table 9.1. Consent conditions requiring the monitoring of seabed scour and local sediment deposition.

Consent reference	Summary of condition	Discharge status
Marine Licence Condition 3.2.1.1.a.3	The PEMP must cover, but not be limited to the following matters: a) Pre-construction, construction (if considered appropriate by the Licensing Authority) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for: 3. Seabed scour and local sediment deposition.	Pre-construction: MS-LOT have confirmed that the pre-construction element of Marine Licence Condition 3.2.1.1.a.3 is discharged by approval of the 'Scour and Local Sediment Deposition Monitoring Strategy Report' (Ref.36) (30/08/2016) ² (Ref.37).
		Construction: MS-LOT has confirmed that the 'Scour and Local Sediment Deposition Monitoring Strategy Report' (Ref.36) has been approved in relation to the construction element of Marine Licence Condition 3.2.1.1.a.3.
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of Marine Licence Condition 3.2.1.1.a.3 at the appropriate time.

² The 'Scour and Local Sediment Deposition Strategy' provided a summary of the pre-construction surveys conducted to date and a consideration of post-construction monitoring. The pre-construction elements of the monitoring strategy remain relevant. Engineering-led post-construction monitoring strategies are being developed for specific assets (i.e. WTG foundations and IACs). The 'Scour and Local Sediment Deposition Strategy' will therefore be superseded by focused methodologies.

Consent reference	Summary of condition	Discharge status
Marine Licence Condition 3.2.2.10.b	The Licensee must submit a CaP that includes the results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing.	Pre-construction surveys of the OfTW area were completed in 2015. Survey results were used to inform the OfTW Cable Plan (CaP) (Ref.26) which was approved by MS-LOT on the (23/01/2017) (Ref.27).

9.3 Approach to monitoring

9.3.1 BOWL intends to use the results of pre-construction geophysical and geotechnical surveys and post-construction engineering-led surveys to monitor the extent of any scour or local sediment deposition that might result from the installation of the wind farm. This approach has been presented to and discussed with MS-LOT, MSS, SNH and JNCC (Ref.29).

9.3.2 Prior to construction start, but before the finalisation of the transmission asset detailed design, a strategy document entitled 'Scour and Local Sediment Deposition Monitoring Strategy Report' (Ref.36) was prepared that detailed BOWL's proposals for scour and local sediment deposition monitoring. MS-LOT confirmed acceptance of the monitoring strategy document in respect of the relevant consent conditions (Table 13.1)

Table 9.2. Summary of key consultation meetings and agreements for seabed scour and local sediment deposition monitoring.

Date	Summary of discussion and agreements
19/01/2015	Meeting to present BOWL's outline scour monitoring strategy. Attended by MS-LOT, MSS, SNH and JNCC (Ref.29).
19/05/2016	BOWL issued the 'Scour and Local Sediment Deposition Monitoring Strategy Report' (Ref.36) to MS-LOT.
30/08/2016	MSS confirm acceptance of the 'Scour and Local Sediment Deposition Monitoring Strategy Report' (Ref.37).
23/01/2017	MS-LOT confirm acceptance and approval of the OfTW CaP (Ref.26 and Ref.27).

9.3.3 A review was undertaken by the MMO of post-consent offshore wind farm monitoring (Ref.10). The review states that scour is not specifically linked to a sensitive environmental receptor and therefore does not inform the environmental receptor impacts. The review describes scour as essentially an engineering issue, and states that scour monitoring should only be conducted by developers and their engineers in order to monitor the structural stability of any foundations and other associated infrastructure over the lifetime of the offshore wind farm project.

9.3.4 BOWL's strategy document (Ref.37) reiterated the conclusions of the MMO report and set out a number of distinct strategies for monitoring scour and sediment deposition around the Offshore Transmission Assets.

9.3.5 The strategy document has now been superseded. The monitoring required by the consent conditions will be delivered through the surveys and inspections required for engineering purposes. The surveys will conform to the Det Norske Veritas (DNV) offshore standards for wind turbine structures (DNV-OS-J101). The final detail of these will be determined post-construction through design and construction verification requirements and by operational requirements for specific project elements.

9.4 Aims and objectives

9.4.1 The aims and objectives of any monitoring undertaken for seabed scour and local sediment deposition are:

- To monitor development, if any, of scour at OTM foundations;
- To monitor any exposure of the export cables; and
- To monitor beach morphological change closest to the export cable landfall point, if necessary.

9.5 Methodology

9.5.1 The primary method for monitoring scour and local sediment deposition will be through analysis of geophysical survey results. Geophysical surveys may include use of multi-beam echo sounder and side scan sonar equipment to provide high resolution bathymetry and data on seabed features.

9.5.2 Pre-construction survey data was reviewed to develop an understanding of seabed conditions and identify any areas that may be susceptible to scour. This work is intended to facilitate an initial estimation of the potential for scour around Offshore Transmission Assets. Any locations considered susceptible to significant scour will be identified for potential future monitoring. The actual scour extent will be monitored at a suitable frequency and remediation will be undertaken if necessary following the installation of the structure.

9.5.3 An export cable inspection was carried out immediately post-installation to confirm that the required depth of lowering (with rock armour used where it was not practical to achieve the target depth) was met.

9.5.4 Beach morphological change and retreat at the export cable landfall location has been monitored by visual and topographic surveys. A baseline walkover survey was conducted in August 2016. Following completion of installation of the export cables at the landfall the pre-construction walkover survey was repeated in February 2018. Comparison of the pre- and post- installation survey data was undertaken to determine the requirement for ongoing monitoring. The 'Post-Construction Beach Condition Survey Report' (Ref.38) concluded that there was no discernible effect of the landfall

works on either the morphology or the sedimentology of the shingle ridge and inter-tidal foreshore at the landfall location. Based on the above findings, it is considered that there is no further requirement for surveying the morphology of the landfall location from a geomorphological perspective.

- 9.5.5 During O&M, geophysical surveys will be undertaken to assess scour around OTM structures.

Table 9.3. Summary of post-construction scour and local sediment deposition monitoring.

Asset	Monitoring strategy
OTM foundations	Engineering design recommendations that scour extent around OTM foundations is monitored at a suitable frequency and that remediation will be undertaken if necessary, following the installation of the structure (Ref.39).

- 9.5.6 The precise post-construction monitoring strategy for scour is to be confirmed following development of the detailed engineering operation and maintenance strategy for the operational phase. This will be based on all design information and as built outputs and may incorporate engineering survey results during the first year of operations. The post-construction monitoring will conform to the relevant international Det Norsk Veritas (DNV) international standards.

- 9.5.7 The Offshore Transmission Assets will be divested to an OFTO and thereafter the responsibility for the implementation of this PEMP, in so far as it applies to the Offshore Transmission Assets, will transfer to the OFTO.

9.6 Reporting

- 9.6.1 BOWL will aim to issue all survey reports to MS-LOT within 3 months of survey completion.

- 9.6.2 The pre-construction geophysical survey datasets are summarised in Tables 13.4 below.

Table 9.4. Pre-construction baseline geophysical data

Date	Reference	Type	Spatial coverage
2011	Gardline (Ref.39)	Single and multi-beam echo sounder, side scan sonar, sub-bottom profiler, magnetometer	OfTW route from wind farm area tie-in to two landfall options (approx. 64 km)
2015	Fugro EMU (Ref.40)	Multi-beam echo sounder, side-scan sonar, sub-bottom profiler, magnetometer	Nearshore (350 m to 1650 m from MHWS)
2015	MMT (Ref.41)	Multi-beam echo sounder, side scan sonar, sub-bottom profiler, magnetometer, ROV imagery	Full survey of OfTW corridor (6m depth contour to wind farm area)
2016	Nexans (Ref.42)	Export cable landfall topographical survey and seismic refraction survey.	Cable duct pipe installation route at landfall between littoral and shallow subtidal

9.7 Programme

9.7.1 The programme for post-construction monitoring as set out in Table 13.4 will be confirmed based on the level of risk associated with scour around installed assets, following initial monitoring results, based on the extent of scour around WTG foundations and exposure of the export cables.

Table 9.4. Summary of seabed scour and local sediment deposition monitoring programme.

Pre-construction	Construction	Post-construction
Pre-construction surveys completed	No surveys required. Pre-construction data analysis completed to inform engineering and Consent Plans.	Scour monitoring at selected OTM foundation locations. Scour monitoring at export cables (if required). Post-construction beach morphological survey completed. No further monitoring proposed.

10 Marine mammals

10.1 Introduction

10.1.1 BOWL has committed to undertake pre-construction, construction and post-construction marine mammal monitoring surveys to better understand the effect of construction activities on marine mammal populations, and validate assumptions made within the ES and SEIS.

10.2 Consent conditions

10.2.1 Consent conditions relevant to marine mammal monitoring are summarised in Table 14.1 below.

Table 10.1. Consent conditions requiring marine mammal monitoring.

Consent reference	Summary of condition	Discharge status
S36 consent Condition 27.b	The PEMP must cover, but not be limited to the following matters: b. The participation by the Company in surveys to be carried out in relation to marine mammals as set out in the Marine Mammal Monitoring Programme (MMMP);	Pre-construction: Pre-construction surveys completed. The 'Pre-construction MMMP Year 3 Annual Report' (Ref.43) was accepted at the MFRAG Marine Mammals (MFRAG-MM) subgroup meeting on 20 June 2017 (Ref.44).
		Construction: BOWL will seek confirmation from MS-LOT on discharge of the construction element of S36 consent Condition 27.b monitoring requirements at the appropriate time. MS-LOT letter (Ref.12) states delivery of construction MMMP will discharge preconstruction requirements. The results were still emerging at that stage. Final discharge of the condition has not yet been sought. Final detailed monitoring design for the construction MMMP (cMMMP), as described in Ref.45 was approved by the MFRAG-MM subgroup (as noted in Table 17.2).
		Post-construction: BOWL will seek confirmation from MS-LOT on discharge of the post-construction element of S36 consent Condition 27.b monitoring requirements at the appropriate time

Consent reference	Summary of condition	Discharge status
S36 consent Condition 28	The Company must participate in any Moray Firth Regional Advisory Group ("MFRAG") established by the Scottish Ministers for the purpose of advising the Scottish Ministers on research, monitoring and mitigation programmes for, marine mammals.	A pre-construction MMMP and cMMMP have been developed in collaboration with the MFRAG-MM subgroup, which takes into account strategic considerations.

10.3 Approach to monitoring

10.3.1 Based on recommendations made by MSS, BOWL and MORP agreed in consultation with MS-LOT to contribute to a regional Marine Mammal Monitoring Programme (MMMP) that is being managed by Professor Paul Thompson from the University of Aberdeen (UoA).

10.3.2 A marine mammal subgroup has been set up as part of MFRAG (referred to as MFRAG-MM³), to discuss and agree the regional MMMP. The scope and objectives of both the pre-construction MMMP and the construction MMMP (cMMMP) were developed by Professor Paul Thompson and agreed in consultation with the MFRAG-MM and additional stakeholders. The following organisations are represented on the MFRAG-MM sub-group: BOWL, MORP, MS-LOT, MSS, SNH, JNCC, and Whale and Dolphin Conservation (WDC).

10.3.3 Following formal approval of the pre-construction MMMP by MS-LOT pre-construction monitoring commenced in 2014 and has now been completed. The 'Pre-construction MMMP Year 3 Annual Report' (Ref.43) was submitted to MFRAG-MM sub-group for approval at the meeting of 20 June 2017.

10.3.4 The scope of the cMMMP has been agreed with the MFRAG-MM and was approved by MFRAG-MM on 17 November 2016 (Ref.46).

10.3.5 A summary of the process by which the pre-construction MMMP has been agreed and approved, and the cMMMP agreed, is presented in Table 14.2 below. Agreement has been reached primarily via discussions within the MFRAG-MM. Meeting agendas and minutes referred to in Table 14.2 can be obtained on the Scottish Government website.

³ MFRAG-MM subgroup was known as the Moray Firth Marine Mammal Monitoring Steering Group prior to 01 April 2015. For ease of reference the Steering Group is referred to as the MFRAG-MM subgroup in this PEMP.

Table 10.2. Summary of key consultation meetings and agreements for marine mammal monitoring.

Date	Summary of key discussion and agreements
02/04/2014	Final draft of the pre-construction MMMP issued to MS-LOT and stakeholders for consultation (Ref.47).
April /May 2014	Stakeholders respond to the pre-construction MMMP. MMMP updated and issued to MFRAG (Ref.48).
10/10/2014	Pre-construction monitoring scope and methodology approved by MS-LOT (Ref.49).
27/11/2014	'MMMP Interim Report' relating to monitoring surveys undertaken between May and September of 2014 completed and circulated to the MFRAG-MM (Ref.50).
16/12/2014	MFRAG-MM meeting to discuss data collected since commencement of the pre-construction MMMP. The next steps for monitoring since the issuing of the MMMP in April 2014 were identified. Discussed the approach to construction monitoring (Ref.51).
26/03/2015	Draft cMMMP circulated to MFRAG-MM for review and comment (Ref.52).
30/03/2015	MFRAG-MM meeting to discuss draft cMMMP and potential scope of a post-construction MMMP. Results from the continuing pre-construction MMMP surveys also discussed. Noted that certain studies under the remit of the pre-construction MMMP will be continued in the cMMMP. As a result of BOWL's intended use of Acoustic Deterrent Devices (ADDs) during piling operations, the cMMMP includes monitoring of responses of harbour seals and harbour porpoises to ADD. MSS agree the outline construction monitoring programme suitably covers the Moray Firth (Ref.53).
24/04/2015	Comments on the draft cMMMP received from SNH and JNCC. CMMMP updated and issued to MFRAG-MM.
06/05/2015	Pre-construction MMMP annual report relating to surveys completed in 2014/2015 was completed and circulated to the MFRAG-MM (Ref.54).
19/06/2015	MFRAG-MM meeting to allow further discussion of suitable construction monitoring methods for focal species and survey timing (Ref.56).
25/11/2015	'Pre-construction MMMP Interim Report' relating to monitoring surveys undertaken between May and September of 2015 completed and circulated to MFRAG-MM (Ref.57).
15/12/2015	MFRAG-MM meeting. Professor Paul Thompson presented the final cMMMP proposal in detail. Seal usage of wind farm areas (both BOWL's and MORP's) was discussed. Due to low usage, it was agreed that there was limited opportunities for investigating harbour seal responses to ADDs and piling soft starts (WP 3.1) (Ref.58).

Date	Summary of key discussion and agreements
05/02/2016	cMMMP issued to MFRAG-MM for consultation. The cMMMP was updated following receipt of comments from attendees at the MFRAG-MM meeting on 15/12/2015 and circulated to the sub-groups for approval (Ref.52).
22/09/16	Meeting with MS-LOT and MSS to present and discuss BOWL's cMMMP (Ref.59).
17/11/16	Professor Paul Thompson presented the final cMMMP approach to MFRAG-MM members for approval (Ref.45 and Ref.46).
20/06/2017	The 'Year 3 Pre-Construction MMMP Annual Report' was accepted by MFRAG-MM (Ref.44 and Ref.43).
21/02/2018	MFRAG-MM meeting: BOWL presented the interim results of the cMMMP and confirmed full analysis of results is underway (minutes in preparation).
08/11/2019	MFRAG-MM meeting: BOWL confirmed interest in exploring contributions to the ongoing long term monitoring programme in the Moray Firth, as BOWL post-construction monitoring. Meeting discussions indicated that contributions would become useful from 2022.

10.3.6 Through discussion with MFRAG-MM it was agreed that the primary focus for monitoring during pre-construction and construction should be harbour seal and bottlenose dolphin. The final cMMMP approved through the MFRAG-MM also incorporated additional shorter-term studies of harbour seal and harbour porpoise responses to Acoustic Deterrent Devices (ADDs) and piling soft start, and noise measurement modelling from piling operations and ADD deployment.

10.4 Aims and objectives

Pre-construction MMMP

10.4.1 The primary aim of the pre-construction MMMP was to collect baseline data on the distribution, abundance and vital rates for the two priority species: bottlenose dolphin and harbour seal, during the pre-construction period (2014-2017) and validate assumptions made in the ES and SEIS.

10.4.2 The pre-construction MMMP consisted of a number of discrete work packages (WPs) for both priority species; the WPs and their objectives are as follows:

WP 1 - Harbour seal monitoring:

WP 1.1: Assess the variability in individual based reproduction and survival.

WP 1.2: Assess the variability of harbour seal trends in abundance in summer and winter.

WP 1.3: Characterise the at-sea distribution and foraging patterns of harbour seals breeding at haul outs in the Moray Firth.

10.4.3 WPs 1.1 and 1.2 ran continuously over the duration of the pre-construction MMMP,

with data acquisition and analysis taking place in each year from 2014 to 2016. WP 1.3 involved data acquisition and analysis during 2014 and 2015.

WP 2 - Bottlenose dolphin monitoring:

WP 2.1: Assess the variability in individual based reproduction and survival rates.

WP 2.2: Assess the long-term variability in the trends in abundance of bottlenose dolphins in the Moray Firth Special Area of Conservation (SAC).

10.4.4 WPs 2.1 and 2.2 ran continuously over the duration of the pre-construction MMMP with data acquisition and analysis taking place in each year.

Construction MMMP

10.4.5 The aims of the cMMMP are to use the baseline data obtained from the pre-construction MMMP studies to support studies of harbour seal and bottlenose dolphin behavioural responses to pile driving noise and any broader scale changes in their distribution during the construction. The cMMMP consists of the continuation of WPs 1 and 2 as outlined above, and also includes two additional work packages, WP 3 and WP 4.

10.4.6 Additionally, under WP 2 (bottlenose dolphin monitoring) a further element, WP 2.3, has been developed that aims to assess the effects of construction on bottlenose dolphins.

10.4.7 WPs 3 and 4 specifically aim to monitor the broad-scale and fine-scale responses of both harbour seal and harbour porpoise to the deployment of an ADD and piling soft start procedures, which were deployed as part of BOWL's PS during piling operations. However, it was discussed at the MFRAG-MM meeting on 15/12/2015, that there is limited opportunity to conduct this monitoring for harbour seal within the wind farm area due to the low numbers of individuals using these offshore foraging areas as indicated by the results from the pre-construction MMMP. Instead, broader scale tracking work under WP 1.3 (at-sea distribution and foraging patterns of harbour seals) may provide opportunistic evidence of responses to ADD and soft start if harbour seal were in nearfield areas prior to start of piling activities.

10.4.8 The objectives of the WPs included in the cMMMP, in addition to those carried over from the pre-construction MMMP (described above) are:

WP 2 – Bottlenose dolphin monitoring:

WP 2.3: Assess the variability in the baseline occurrence of bottlenose dolphins in favoured areas (key sites) within the Moray Firth SAC and southern Moray Firth coast during construction.

WP 3 - Monitoring deployment of ADD

WP 3.2: Assess the broad-scale and fine-scale responses of harbour porpoises to ADD and piling soft starts.

WP 4 – Noise measurement and modelling

WP 4.1: Quantify the temporal variation in source levels of piling noise in relation to differences in hammer energy and ground conditions across the wind farm area; and

WP 4.2: Quantify the spatial variation in received levels of piling noise and ADD noise exposure.

- 10.4.9 The scope of any post-construction MMMP will be informed by the outcomes of pre-construction and construction monitoring, developed in consultation with the MFRAG-MM and subject to approval by MS-LOT on behalf of Scottish Ministers.

10.5 Methodology

- 10.5.1 Agreed pre-construction survey methods were detailed in the pre-construction MMMP (referred to in full as the 'Strategic Regional Marine Mammal Monitoring Programme for Assessing the Population Consequences of Constructing the BOWL and Moray Offshore Renewables Limited [now MORP] Wind Farm Developments') (Ref.50).

- 10.5.2 The pre-construction surveys have been designed to complement existing datasets within the Moray Firth and wider region for the two-priority species: bottlenose dolphin and harbour seal.

- 10.5.3 Agreed methods for during construction surveys are provided in the cMMMP report (Ref.45). The final cMMMP was approved by the MFRAG-MM sub-group members on the 17 November 2016. Work under the cMMMP commenced in February/March 2017, prior to the start of piling operations in April 2017, with the capture and tagging of harbour seals at Loch Fleet and the deployment of an array of acoustic devices.

10.6 Reporting

- 10.6.1 All pre-construction fieldwork from 2014 to 2016 was successfully completed, the data have been archived and analyses used to address key WP objectives. These data sets now provide a robust baseline on the vital rates, population status and distributions of harbour seal and bottlenose dolphin populations in the Moray Firth. This information underpinned ongoing construction monitoring for the wind farm.

- 10.6.2 Results and data analysis for the pre-construction surveys during 2014 to 2016 have been detailed in annual reports, culminating in the final pre-construction monitoring report entitled 'Strategic Regional Pre-Construction Marine Mammal Monitoring Programme Annual Report 2017' (Ref.43). This presents the results and analysis of data collected between 2014 and 2016 and confirms the successful completion of the planned pre-construction data collection to provide a robust baseline for comparison against construction and post-construction monitoring results.

10.6.3 Piling operations associated with the construction of the wind farm commenced on 02 April 2017 and were completed on 02 December 2017.

10.6.4 cMMMP fieldwork was started in February 2017 and all core fieldwork was completed by the end of 2018. Some work within WP 1.2, WP 2.3 and WP 3.2 will continue until March 2019.

10.6.5 A summary of initial results from the different work packages is provided below.

WP 1 - Harbour seal monitoring: Photo-ID studies and counts of harbour seals at Loch Fleet indicate that numbers at this site remained high through the construction period, with 55-60 mothers being recorded with pups in both pre-construction and construction years.

Loch Fleet continued to be the most important pupping site in region, with small numbers recorded at other sites along the north coast of the Moray Firth in both summer and winter.

GPS tracking of 31 Loch Fleet harbour seals demonstrated that none of these individuals used areas within 25km of the BOWL site; either in the two months prior to piling or during the first three months of piling. Integration of these seal tracks with predicted received levels from noise propagation models indicate that no seals received cumulative noise exposures that exceeded current NOAA thresholds.

WP 2 - Bottlenose dolphin monitoring: Dolphins were encountered all photo-ID trips undertaken within the SAC during both 2017 and 2018. Initial analyses indicate that over 100 individuals were recorded in both years; representing a similar proportion of the East coast population to that seen during the pre-construction period. PAM monitoring of occurrence at core sites within the SAC and along the southern coast of the Moray Firth suggest that all areas continued to be in-line with baseline data.

WP 3 - Monitoring deployment of ADD. Extensive monitoring of porpoise was carried out during two phases of work in the early and late phase of piling. These data highlighted that behavioural responses to piling were lower than predicted under current assessment models, and further declined through the construction period. Analyses also highlighted that responses were also related to vessel noise, and were stronger in the presence of ADD use. Lower intensity PAM monitoring of porpoise occurrence at key sites has been continued throughout 2017 and 2018 to further explore responses to different phases of the construction period.

WP 4 – Noise measurement and modelling. Noise measurements were made at key sites throughout 2017 and 2018. More intensive studies were carried out in March to characterise ADD signals and September to explore how received levels varied with hammer energy. These data were used to optimise noise propagation models that could then be used to predict received levels at other sites. Analyses of these data

have also highlighted that received levels of noise are not directly related to hammer energy, but appear to vary markedly depending upon the piles penetration depth.

10.6.6 The analysis of data collected within all Work Packages is continuing. Data from WP 1 and WP 2 will be built upon through further data collection during construction at MORP. These integrated data from the regional MMMP will be used to address the broader aims within these work packages. The final fieldwork report, and scientific publications on key findings within WP 3 and WP 4, were submitted to MRAG-MM by University of Aberdeen on 27th April 2020.

10.7 Programme

10.7.1 The programme for all marine mammal monitoring surveys is detailed in the cMMMP (Ref.52) and summarised in Table 14.3 below.

Table 10.3: Summary of marine mammal monitoring programme.

Pre-construction	Construction	Post-construction
WP 1 (harbour seal monitoring) and WP 2 (bottlenose dolphin monitoring) monitoring surveys undertaken during 2014-2016. Pre-construction monitoring complete.	WP 1 (harbour seal monitoring) and WP 2 (bottlenose dolphin monitoring) monitoring has been carried out throughout 2017 and 2018 WP 3 (monitoring responses to ADDs) was carried out through experimental ADD exposures prior to piling, and through an integrated analysis of exposure to piling noise and ADD exposure during two phases of construction. WP 4 (noise measurement and modelling) commenced in advance of piling operations and was completed in Quarter 4 2017. Construction monitoring complete.	BOWL are exploring contributions (likely 2022 onwards) to the ongoing long term marine mammal monitoring programme in the Moray Firth, for the marine mammal component of post-construction monitoring. By default, as this monitoring is likely to be carried out over the wider Moray Firth area, it is anticipated that this will fulfil the post-construction marine mammal monitoring for the OTA. Discussions will be ongoing with MFRAG to confirm arrangements for this..

11 Programme of survey works

11.1.1 Table 111 provides an overview of when the monitoring activities set out in this PEMP for each receptor group have or will be conducted.

Environmental consideration	Development Phase and Year										
	Pre-construction			Construction			Post-construction- Operations				
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Diadromous Fish			✓								
Benthic communities		✓									
Seabed scour	✓	✓	✓			✓					
Marine mammals	✓	✓	✓	✓	✓						

✓	Survey has been completed
	Survey currently underway
	Survey will be completed
	Survey may be conducted but none determined
	BOWL exploring contributions to Moray Firth marine mammal programme for the WFA – anticipated this will by default fulfil post-construction marine mammal monitoring for the OTA.
	No surveys will be undertaken

Table 11.1: Summary of monitoring programme for each topic

12 Licenses and legal requirements

12.1.1 In order to allow survey activity to proceed, licences and dispensations may need to be sought by BOWL in advance of planned surveys. Table 12.1 below identifies the licensing requirements associated with PEMP surveys, which BOWL will adhere to.

Table 12.1. Notices, licenses and approvals of PEMP survey activity.

PEMP aspect	Licence / Other legal requirement
All offshore surveys	Issue of a Notice to Mariners stating the location, nature and duration of the survey.
	Issue of a notice in the Kingfisher Fortnightly Bulletin stating the location, nature and duration of the survey.
Benthic surveys	Submission of a Notice of Exempted Activity form to MS-LOT prior to commencing any benthic survey activities. Application for Small Works Licence (are similar) from Crown Estate Scotland.
Atlantic salmon survey	Application for a licence for carrying out procedures on animals according to the Animals (Scientific Procedures) Act 1986. This will be a personal licence held by one of the surveyors. Home Office Licence for smolt tagging.
	Issue of a Notice to Mariners describing the survey and the duration of deployment of the acoustic receiver arrays. Application for Small Works Licence (are similar) from Crown Estate Scotland.
	Issue of a notice in the Kingfisher Fortnightly Bulletin describing the survey and the duration of deployment of the acoustic receiver arrays.
	Application for a Marine Licence to cover the deployment of moored acoustic devices. Application for Small Works Licence (are similar) from Crown Estate Scotland.
Marine mammals	Application for a licence to disturb European Protected Species (EPS) under the Conservation (Natural Habitats, &c.) Regulations 1994 and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007.

13 Compliance with the Application, ES and SEIS

13.1.1 Part of Marine Licence Condition 3.2.1.1 states:

“The PEMP must be in accordance with the ES as it relates to environmental monitoring.”

13.1.2 Within the ES and SEIS, BOWL made a number of commitments in relation with environmental monitoring. Commitments made are presented in full in Appendix A, which also identifies how each commitment has been addressed within this PEMP.

13.1.3 Since the Application for consents was made, BOWL’s approach to environmental monitoring has been refined and commitments made in the ES and SEIS are in some cases superseded by the monitoring approach presented in this PEMP.

14 References

Table 14.1: References of consent documentation

Ref.	Reports	Document no.
1.	Scottish Government (2014). 04461/14/0 Windfarm Marine Licence. Marine Scotland, Aberdeen.	LF000005-REP-290
2.	Scottish Government (2016). 04461/16/0 Windfarm Marine Licence. Marine Scotland, Aberdeen.	LF000005-LET-453
3.	Scottish Government (2018). 04461/18/0 Windfarm Marine Licence. Marine Scotland, Aberdeen.	LF000005-LET-722
4.	Scottish Government (2018). 04461/18/1 Windfarm Marine Licence. Marine Scotland, Aberdeen.	LF000005-LET-727

Table 14.2: References of reports

Ref.	Reports	Document no.
<i>Diadromous fish</i>		
17.	BOWL (2015) Active tracking study	LF000005-REP-598
21.	BOWL (2015) Smolt Tracking Methodology Report	LF000005-REP-671
23.	Newton, M., Main, R., and Adams, C., (2017) Atlantic Salmon <i>Salmo Salar</i> smolt movements in the Cromarty and Moray Firths, Scotland.	LF000005-REP-1854
<i>Benthic communities</i>		
25.	BOWL (2014) Post-Construction Benthic Monitoring Strategy	LF000005-REP-341
28.	BOWL (2015) Pre-construction Annex 1 habitat survey report of the OfTW	LF000005-REP-584
<i>Seabed scour</i>		
36.	BOWL (2015) BOWL Scour and Local Sediment Deposition Monitoring: Proposed Strategy	LF000005-STR-043
38.	BOWL (2018) Post-Construction Beach Condition Survey Report	LF000005-REP-2427
39.	Siemens (2017) Detailed Design – OTM - Scour Assessment Report	LF000005-REP-734
	BOWL (2017) Marine growth and scour monitoring strategy.	LF000005-PLN-662
<i>Marine mammals</i>		
43.	Graham, I.M, Cheney, B., Hewitt, R.C., Cordes, L. S., Hastie, G.D and Thompson, P.M (2017) Strategic Regional Pre-Construction Marine Mammal Monitoring Programme Annual Report 2017.	LF000005-REP-1903

Ref.	Reports	Document no.
45.	BOWL (2016) Addendum to the BOWL Construction MMMP – studies during piling	LF000005-REP-1367
50.	(2014) Strategic Regional Marine Mammal Monitoring Programme for Assessing the Population Consequences of Constructing the BOWL and Moray Offshore Renewables Limited [now MORP] Wind Farm Developments	LF000005-REP-355
52.	BOWL (2015) Construction Marine Mammal Monitoring Programme	LF000005-REP-550
54.	Thompson, P.M (2015) Marine Mammal Monitoring Programme Annual Report	LF000005-REP-538
57.	Thompson, P.M (2015) Pre-construction MMMP Interim Report	LF000005-REP-816
General		
10.	MMO (2014). Review of post-consent offshore wind farm monitoring data associated with licence conditions. A report produced for the Marine Management Organisation, pp 194. MMO Project No: 1031. ISBN: 978-1-909452-24-4.	n/a

Table 14.3: References of correspondence

Ref.	Letters	Document no.
Diadromous fish		
11.	MS-LOT (2016) confirm discharge of pre-construction element of Conditions 27.a.5	LF000005-LET-333
13.	MFRAG (2016) approval of the proposed methodology for pre-construction smolt tracking survey	LF000005-EMA-272
15.	BOWL (2015) issue briefing note including proposed methodology for smolt tracking in the Cromarty Firth for discussion with MSS	LF000005-BRN-076
19.	BOWL (2015) Letter to MSS requesting acceptance of proposed Cromarty Firth smolt tracking study methodology	LF000005-LET-235
20.	MSS (2015) letter confirming acceptance of Cromarty Firth smolt tracking study	LF000005-LET-250
24.	BOWL (2017) issue of survey report to MS-LOT	LF000005-LET-622
Benthic communities		
30.	BOWL (2015) response to MSS regarding comments on benthic survey strategy	LF000005-LET-128
32.	BOWL (2015) confirmation to MSS and MS-LOT of pre-construction benthic grab sample locations	LF000005-EMA-089

Ref.	Letters	Document no.
33.	BOWL (2015) issue pre-construction survey reports and benthic post-construction survey strategy report to MSS for acceptance	LF000005-LET-290
34.	MSS (2016) accepted benthic survey reports. Query raised regarding the implications of the reported change in the dominant biotope across the wind farm area for the post-construction monitoring strategy.	LF000005-EMA-276
35.	MSS (2016) confirm acceptance of the survey report and the proposed post-construction monitoring strategy	LF000005-EMA-273
	BOWL response to MSS points concerning proposed post-construction monitoring strategy	LF000005-LET-338
Seabed scour		
37.	MS-LOT (2016) Written approval of the Scour and Local Sediment Deposition Monitoring: Proposed Strategy.	LF000005-EMA-408
Marine mammals		
47.	BOWL (2014) Final draft of the pre-construction MMMP issued to MS-LOT and stakeholders for consultation.	LF000005-LET-037
48.	BOWL (2014) Updated pre-construction MMMP issued to MFRAG following revisions based on stakeholder comments.	LF000005-LET-359
49.	MS-LOT (2014) Letter confirming acceptance of pre-construction MMMP scope and methodology.	LF000005-LET-051
General		
12.	MS-LOT (2016) Written acceptance of the PEMP and discharge of various pre-construction elements of the monitoring programme.	LF000005-LET-630
27.	MS-LOT (2016) Confirmation of discharge of Wind Farm CaP condition and approval of monitoring and mitigation in respect of cable scour/exposure and diadromous fish.	LF000005-EMA-344
-	MS-LOT (2015) Confirmation of the discharge of the PS and approval of fish and marine mammal monitoring and mitigation.	LF000005-LET-280
-	MS-LOT (2017) Confirmation of discharge of OfTW CaP condition and approval of monitoring and mitigation in respect of cable scour/exposure and diadromous fish.	LF000005-LET-601

Table 14.4: References of meeting minutes and consultations

Ref.	Minutes of meetings	Document no.
Diadromous fish		
14.	(2014) Meeting with MSS, MS-LOT to discuss BOWL participation in Pentland Salmon Initiative to achieve required monitoring.	LF000005-MOM-132

16.	(2014) Meeting with MSS at Battleby. MSS request BOWL enhance marine tracking element of proposed study	LF000005-MOM-314
18.	(2015) Meeting with local District Salmon Fishery Boards (DSFBs) who provided positive support for the study proposal	LF000005-MOM-343
22.	(2017) Meeting with local DSFBs to present the results of the Cromarty Firth Smolt tracking study.	LF000005-MIN-686
Benthic communities		
29.	(2015) Meeting to present and discuss the scope of pre-construction benthic surveys	LF000005-MOM-230
31.	(2015) MFRAG meeting to discuss benthic post-construction monitoring and scope of monitoring	LF000005-MOM-310
Marine mammals		
44.	(2017) Meeting with MFRAG-MM in which the 'Pre-construction MMMP Year 3 Annual Report' was accepted	LF000005-MOM-721
45.	(2016) Meeting to finalise and agree final CMMMP	LF000005-MOM-652
51.	(2014) Meeting with MFRAG-MM to present pre-construction marine mammal collected to date.	LF000005-MOM-410
53.	(2015) Meeting with MFRAG-MM to discuss the scope of the CMMMP and subsequent post-construction monitoring.	LF000005-MOM-313
56.	(2015) Meeting with MFRAG-MM to discuss the focus and methodology of the CMMMP.	LF000005-MOM-360
58.	(2015) Meeting with MFRAG-MM to present the full CMMMP.	LF000005-MOM-389
59.	(2016) Meeting with MFRAG-MM to present the full CMMMP.	LF000005-MOM-708

Table 14.5: References of Consent Plans

Ref.	Consent Plans	Document no.
5.	Project Environmental Monitoring Programme (Wind Farm Assets)	LF000005-PLN-722
6.	Project Environmental Monitoring Programme	LF000005-PLN-179
7.	Operations and Maintenance Plan (Offshore Transmission Assets)	LF000005-PLN-185
8.	Archaeology Written Scheme of Investigation and Procedures for Archaeological Discoveries (Beatrice Offshore Transmission System)	LF000005-PLN-725
9.	Decommissioning Programme (Offshore Transmission Assets)	LF000005-PLN-727
26.	Offshore Transmission Cable Plan	LF000005-PLN-214

Table 14.6: References to other documentation

Ref.	Consent Plans	Document no.
39.	Gardline 2011 Geophysical Survey	BEA-REP-SAS-GARD-115
40.	Fugro EMU 2015 Geophysical Survey	LF000005-REP-388
41.	MMT 2015 Geophysical Survey	LF000005-REP-603
42.	Nexans 2016 Geophysical Survey	LF000005-REP-1229

Appendix A - ES and SEIS Commitments

Table A1 presents the commitments made by BOWL in the ES and SEIS to monitoring of the Development. The table provides details of the commitments and a cross-reference to where each commitment is implemented.

Table A1. ES and SEIS Commitments

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
ES	10 Benthic Ecology page 49, paragraph 175	A program of benthic monitoring will be agreed with the relevant authorities.	Section 12 of Wind Farm Assets PEMP
ES	11 Fish and Shellfish page 43, paragraph 158	BOWL will work with key stakeholders and MS-LOT to identify any future monitoring programmes considered necessary.	Sections 8, 9 and 10 of Wind Farm Assets PEMP
ES	12 Marine Mammals page 68, paragraph 229	BOWL will continue to work with MS-LOT and key stakeholders to undertake work to fill gaps in the understanding of the effects of underwater noise on marine mammals behaviourally and at a population level. BOWL will work collaboratively with the wider offshore wind industry in Scotland and the UK as well as with key experts in the field of underwater noise and marine mammals to undertake this work.	Section 14.3 of Wind Farm Assets PEMP
ES	12 Marine Mammals page 69, paragraph 231	BOWL will work with MS-LOT, SNH/JNCC and other key stakeholders to develop the specification for an appropriate monitoring programme.	Section 14 of Wind Farm Assets PEMP
ES	13 Wind Farm Ornithology page 58, paragraph 196	It is expected that best practice monitoring of bird use within the wind farm area and 4 km buffer will be undertaken. Typically, this comprises periods of pre-construction, construction and post-construction monitoring in order to identify any changes in bird usage of the wind farm area attributable to the wind farm. The scope and periods (e.g. post-consent/pre-construction) of monitoring required will be determined in discussion with SNH and MS-LOT.	Section 7 of Wind Farm Assets PEMP

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
ES	16 Commercial Fisheries page 34, paragraph 157 and page 37, paragraph 176	Post construction surveys will be undertaken to assess the seabed status in the immediate vicinity of construction and installation activities.	Section 13 of Wind Farm Assets PEMP
ES	21 Physical Processes OfTW page 20, paragraph 119	The development of any scour will also be monitored post construction	Section 9 of Offshore Transmission Assets PEMP (this document)
ES	21 Physical Processes OfTW page 20, paragraph 119	Visual and/or bathymetric surveys will be undertaken pre- and post-construction along part or all of the OfTW route and these surveys compared.	Section 9 of Offshore Transmission Assets PEMP (this document)
ES	21 Physical Processes OfTW page 20, paragraph 121	Visual and/or topographic surveys will be undertaken pre- and post-construction between the onshore jointing bay and an adjacent point on the beach around or below Mean Low Water Springs. These surveys will be compared to monitor the actual (naturally occurring) rates of beach morphological change and retreat.	Section 9 of Offshore Transmission Assets PEMP (this document)
ES	22 Benthic Ecology OfTW page 18, paragraph 95	Monitoring of the effects from cable installation will be included as part of the overall benthic monitoring plan, to be agreed with most notably (but not limited to) MS-LOT and SNH.	Section 8 of Offshore Transmission Assets PEMP (this document)
ES	23 Fish and Shellfish OfTW page 33, paragraph 120	BOWL will work with key stakeholders and MS-LOT to identify any future monitoring programmes considered necessary.	Section 7 of Offshore Transmission Assets PEMP (this document)
ES	27 Commercial Fisheries OfTW page 54, paragraph 230	BOWL will work with key stakeholders and MS-LOT to identify any future monitoring programmes considered necessary.	Section 7 of Offshore Transmission Assets PEMP (this document)
ES	28 Shipping and Navigation OfTW page 21, table 28.3	Periodic and planned surveys of cable routes to monitor burial depths and seabed mobility.	Section 9 of Offshore Transmission Assets PEMP (this document)

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
SEIS	5 Fish and Shellfish Ecology page 3, table 5.1	Consultation will be undertaken with MSS to discuss the proposal to undertake a pre-construction sandeel survey.	Section 10 of Wind Farm Assets PEMP
SEIS	5 Fish and Shellfish Ecology page 3, table 5.1	Sandeel survey methodology will be in line with that used by MORL.	Sections 10 of Wind Farm Assets PEMP
SEIS	5 Fish and Shellfish Ecology page 4, table 5.1	BOWL is engaging with MS-LOT and other developers to define an adequate salmon and sea trout monitoring strategy.	Section 11 of Wind Farm Assets PEMP and Section 7 of Offshore Transmission Assets PEMP (this document)
SEIS	5 Fish and Shellfish Ecology page 11, table 5.1	BOWL is committed, in consultation with MS-LOT, to undertake the appropriate additional surveys as a condition of consent. These may include; sandeel survey; and cod survey.	Section 8 and 10 of Wind Farm Assets PEMP
SEIS	5 Fish and Shellfish Ecology page 12, table 5.2	A post installation survey is likely to be undertaken following completion of cable installation and protection works trenching and rock dumping, depending on the final construction plans	Sections 8, 9, 10 and 11 of Wind Farm Assets PEMP and Section 9 of Offshore Transmission Assets PEMP (this document)
SEIS	5 Fish and Shellfish Ecology page 55, paragraph 130	BOWL is committed, in consultation with MS-LOT, to undertake the appropriate additional surveys as a condition of consent. These may include; sandeel survey; and cod survey.	Sections 8 and 10 of Wind Farm Assets PEMP
SEIS	6 Marine Mammals page 3, table 6.1	A MMMP, including the collection of pre-construction baseline data, is proposed.	Sections 14 of Wind Farm Assets PEMP and Section 10 of Offshore Transmission Assets PEMP (this document)

Source	Reference (Chapter, page, paragraph)	Details of Commitment	Implementation
SEIS	6 Marine Mammals page 47, paragraph 83	ADDs are a particularly useful tool for mitigating effects upon seals as a result of the difficulties associated with identifying and observing these species, particularly at night and during periods of poor visibility.	Section 14 of Wind Farm Assets PEMP and Section 10 of Offshore Transmission Assets PEMP (this document)
SEIS	6 Marine Mammals page 48, paragraph 86	BOWL is working together with MORL to devise a MMMP that tests the predictions of the assessment of potential effects.	Section 14 of Wind Farm Assets PEMP and Section 10 of Offshore Transmission Assets PEMP (this document)
SEIS	6 Marine Mammals page 49, paragraph 93	The MMMP will include acoustic surveys to monitor the existing noise levels in the Moray Firth and collation of data from other studies that can provide information on key prey populations, physical processes, by-catch etc. Further information on the Population Consequences of Disturbance (PCoD) model will be sought from the Sea Mammal Research Unit (SMRU) Ltd and UoA study which is due for publication this year.	Section 14 of Wind Farm Assets PEMP and Section 10 of Offshore Transmission Assets PEMP (this document)
SEIS	15 Summary of Residual Effects page 15, paragraph 33	A detailed MMMP is currently being developed in consultation with developers, MS-LOT, MSS, SNH and the UoA to allow the unique existing baseline information of the Moray Firth to be built on, and to provide the opportunity to better understand the interactions between marine mammals and offshore wind farms.	Section 14 of Wind Farm Assets PEMP and Section 10 of Offshore Transmission Assets PEMP (this document)