European Offshore Wind Deployment Centre

UXO Clearance Marine Licence Application

ABE-CM-DB-0010

28/03/2017

Prepared by:	Natural Power Consultants Ltd	Environmental Consultant		21/03/2017
	NAME	ROLE		DATE
Reviewed by:	Karolis Kairelis	Geo Engineer		28/03/2017
	NAME	ROLE		DATE
Approved	29.03.2017	01	Adam Ezzamel	[redacted]
STATUS	**DATE**	**REVISION**	**NAME**	**SIGNATURE**

marinescotland

T: +44 (0)1224 295579
E: ms.marinelicensing@gov.scot

The Scottish Government
Riaghaltas na h-Alba

Marine Licence Application for Construction Projects

Version 1.0

Marine (Scotland) Act 2010

Marine Scotland, 375 Victoria Road, Aberdeen, AB11 9DB
http://www.gov.scot/Topics/marine/Licensing/marine

Acronyms

Please note the following acronyms referred to in this application form:

BPEO	Best Practicable Environmental Option
EIA	Environmental Impact Assessment
ES	Environmental Statement
MHWS	Mean High Water Springs
MMO	Marine Mammal Observer
MPA	Marine Protected Area
MS-LOT	Marine Scotland – Licensing Operations Team
PAM	Passive Acoustic Monitoring
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WGS84	World Geodetic System 1984

Explanatory Notes

The following numbered paragraphs correspond to the questions on the application form and are intended to assist in completing the form. These explanatory notes are specific to this application and so you are advised to read these in conjunction with the Marine Scotland Guidance for Marine Licence Applicants document.

1. Applicant Details

The person making the application who will be named as the licensee.

2. Agent Details

Any person acting under contract (or other agreement) on behalf of any party listed as the applicant and having responsibility for the control, management or physical deposit or removal of any substance(s) or object(s).

3. Payment

Indicate payment method. Cheques must be made payable to: The Scottish Government.

Marine licence applications will not be accepted unless accompanied by a cheque for the correct application fee, or if an invoice is requested, until that invoice is settled. Target timelines for determining applications do not begin until the application fee is paid.

4. Application Type

Indicate if the application is for a new construction site or an existing construction site. Provide the existing or previous consent/licence number and expiry date if applicable.

5. Project Details

(a) Give a brief description of the project (e.g. construction of a new sea outfall).

(b) Provide the total area of proposed works in square metres.

(c) Provide the proposed start date of the project. The start date will not be backdated, since to commence a project for which a licence has not been obtained will constitute an offence, which may result in appropriate legal action. A licence is normally valid for the duration of the project but not exceeding 3 years. If a project will not be completed before a marine licence lapses, it will be necessary for licence holders to re-apply for a further licence to continue any ongoing work at least 14 weeks prior to the expiry date of the licence. **Target duration for determination of a marine licence application is 14 weeks.**

(d) Provide the proposed completion date of the project.

(e) Provide the cost of the works seawards of the tidal limit of MHWS. This estimate should only cover

work taking place below the tidal level of MHWS and must take into consideration the cost of materials, labour fees etc.

(f) Describe the location of the proposed works. Include a list of the latitude and longitude co-ordinates (WGS84) of the boundary points of the proposed project. WGS84 is the World Geodetic System 1984 and the reference co-ordinate system used for marine licence applications. Co-ordinates taken from GPS equipment should be set to WGS84. Coordinates taken from recent admiralty charts will be on a WGS84 compatible datum. Ordnance survey maps do not use WGS84. In a few cases, (e.g. laying of long pipelines) it may only be practicable to supply co-ordinates for the start and end points.

Example: For positions read from charts the format should be as in the example: 55°55.555'N 002°22.222'W (WGS84). The decimal point specifies that decimals of minutes are used and the datum is stated explicitly. If seconds are used then the format should be as in the example: 55°55'44''N 2°22'11''W (WGS84).

It is important that the correct positions, in the correct format, are included with this application, as any errors will result in the application being refused or delayed.

To supplement your application, please provide photographs of the project location and submit these with your application. Please also provide a suitably scaled extract of an Ordnance Survey Map (1:2,500 scale but not more than 1:10,000) or Admiralty Chart which must be marked to indicate:

- the full extent of the works in relation to the surrounding area;
- latitude and longitude co-ordinates defining the location of the works;
- the level of MHWS;
- any adjacent SAC, SPA, SSSI, MPA, Ramsar or similar conservation area boundary.

Drawings and plans will be consulted upon. If they are subject to copyright, **it is the responsibility of the applicant to obtain necessary approvals to reproduce the documents and to submit suitably annotated copies with the application.**

Sewer outfalls, discharge pipes for industrial waste etc. The size and description of the pipe must be shown on the longitudinal sections and also details of its supports, foundations, methods of jointing and details of any tidal flaps.

Bridges over tidal waters: An elevation with longitudinal and cross-sections of the bridge to a suitable scale must show the dimensions of the spans and width of piers, etc. above and below MHWS and the maximum and minimum heights of the undersides of the superstructures above MHWS. The headroom above MHWS and the width of span of the nearest bridges, if any, above and below the site must be stated.

Tunnels under tidal waters: The longitudinal section of the tunnel must show the distances between the bed of the river or estuary and the top of the tunnels. Cross-sections must show the internal and external dimensions of the tunnel and particulars of construction. When a proposed future dredging level is known this must also be shown on all sections.

Overhead cables: Catenary must be supplied in addition to the site plan showing the minimum clearance of the cable at MHWS and the electrical clearance allowed.

(g) Indicate if the project is located within the jurisdiction of a statutory harbour authority and provide details of the statutory harbour authority where relevant.

(h) Provide a full method statement, including schedule of works and the ultimate fate of the structure.

(i) Provide assessment of the potential impacts the works may have, including interference with other uses of the sea. Please include details of areas of concern e.g designated conservation areas, such as a SAC, SPA, SSSI, MPA or Ramsar site and shellfish harvesting areas. Further guidance on designated conservation areas can be obtained from SNH at this website:

http://gateway.snh.gov.uk/sitelink/index.jsp and guidance on shellfish harvesting areas can be obtained from http://www.foodstandards.gov.scot/ with regards to the Shellfish Waters Directive (2006/113/EC) which has parameters set to protect the water quality in which edible shellfish are grown.

Applicants should also be aware of the need to pay due regard to coastal and marine archaeological matters and attention is drawn to Historic Scotland's Operational Policy Paper HP6, "Conserving the Underwater Heritage".

Any application for beach replenishment works must be cross checked as to whether the proposed site is a designated bathing water site. If so, all physical works should ideally be done outwith the Bathing Water Season (1st June to 15th September). Further guidance on the Bathing Waters Directive (2006/7/EC) can be obtained from http://apps.sepa.org.uk/bathingwaters/.

Where there are potential impacts from the works, please provide details of proposed mitigation, such as use of MMOs or PAM, in response to potential impacts.

6. Deposits and/or Removals

(a) Complete the table to indicate all permanent substances or objects to be deposited and/or removed from below MHWS. If you propose using types of substances or objects for which a specific box is not provided in the table, please describe the nature of such substances or objects in the box marked "other".

(b) Please indicate the method of delivery of any substance(s) or object(s) to be placed below MHWS.

(c) Where the proposed work involves salt marsh feeding, beach replenishment or land reclamation the description of the substances or objects must include details of its chemical quality. Where the substances or objects have not been chemically analysed, MS-LOT may request representative samples for analysis or require the applicant to arrange for analyses to be undertaken before the marine licence application can be determined.

(d) If temporary deposits are required, please provide details as with the permanent deposits above. The temporary deposit location details (Latitude and Longitude WGS84) must be added to the form, and the period of time the site will be used must be provided. If granting a licence, MS-LOT will include on the document details of any area that has been approved as a temporary deposit site.

7. Disposal of Dredged Substance(s) or Object(s) at Sea

(a) If you are proposing to dispose of any excess substance(s) or object(s) arising from the project at sea, a separate marine licence will be required (see Dredging and Sea Disposal application form). The granting of a marine licence for construction projects does not imply that a marine licence for sea disposal will also be granted as different assessment criteria are used to determine each type of application. If a separate application is being submitted for dredging and sea disposal then this must be accompanied with a BPEO report.

(b) Provide the quantity of dredged substance(s) or object(s) for sea disposal in wet tonnes.

8. Noise Monitoring

Under the Marine Strategy Regulations (2010), there is now a requirement to monitor loud, low to mid frequency (10Hz to 10kHz) impulsive noise. Activities where this type of noise is produced include seismic airguns, other geophysical surveys (<10kHz), pile driving, explosives and certain acoustic deterrent devices. Where noisy activity is being undertaken, you must complete an initial registration form for the noise registry which allows you to provide details on the proposed work. Completion of a 'close-out' form, which allows licensees to provide details of the actual dates and locations where the activities occurred, is also required within 12 weeks of the completion of the 'noisy' activity or, in the case of prolonged activities such as piling for harbour construction or wind farms, at quarterly intervals or after each phase of foundation installation.

These forms can be downloaded from:
http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/noise-reduction

Marine licence applications will not be accepted until this form has been completed and submitted.

9. Statutory Consenting Powers

Please describe in the answer to this question what (if any) statutory responsibilities you (or your client) have to consent any aspect of the project.

10. Scotland's National Marine Plan

Scotland's National Marine Plan has been prepared in accordance with the EU Directive 2014/89/EU, which came into force in July 2014. The Directive introduces a framework for maritime spatial planning and aims to promote the sustainable development of marine areas and the sustainable use of marine resources. It also sets out a number of minimum requirements all of which have been addressed in this plan. In doing so, and in accordance with article 5(3) of the Directive, Marine Scotland have considered a wide range of sectoral uses and activities and have determined how these different objectives are reflected and weighted in the marine plan. Land-sea interactions have also been taken into account as part of the marine planning process. Any applicant for a marine licence should consider their proposals with reference to Scotland's National Marine Plan. A copy of Scotland's National Marine Plan can be found at: http://www.gov.scot/Publications/2015/03/6517/0

Indicate whether you have considered the project with reference to Scotland's National Marine Plan and provide details of considerations made with reference to the policies, including but not limited to General Policies 7 and 13 (GEN 7 and GEN 13), that have been considered. If you have not considered the project with reference to Scotland's National Marine Plan please provide an explanation.

11. Pre-Application Consultation

Certain activities will be subject to public pre-application consultation. Activities affected will be large projects with the potential for significant impacts on the environment, local communities and other legitimate uses of the sea. The new requirement will allow those local communities, environmental groups and other interested parties to comment on a proposed development in its early stages – before an application for a marine licence is submitted. Further information can be obtained from: http://www.scotland.gov.uk/Resource/0043/00439649.pdf

If applicable, please provide your pre-application consultation report with your application.

12. Consultation (other than carried out under pre-application consultation)

Provide details of all bodies consulted and give details of any consents issued including date of issue.

13. Environmental Assessment

(a) Under the Marine Works Environmental Impact Assessment (EIA) Regulations 2007, there may be a requirement for certain projects to undergo an EIA and produce an ES. If EIA is required, MS-LOT will not determine a marine licence application until the EIA consent decision in respect of the marine licence application has been reached. Please confirm if the project falls under Annex I or II of Directive 85/337/EEC: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011L0092&from=EN in relation to the Marine Works (EIA) Regulations 2007.

Marine licence applications for proposals which fall under the regulations will not be accepted unless a screening opinion has been issued in relation to this.

(b) Please indicate if an EIA has been undertaken and whether it was for the marine licence application to which this application relates or for any other EIA regulator (e.g local authority). Please attach any previous ES to the application.

MS-LOT will not determine a marine licence application until the EIA consent decision in respect of any regulated activity associated with the marine licence application has been reached.

14. Associated Works

Indicate whether the application is associated with any other marine projects (e.g. land reclamation, marine/harbour construction works, dredging and sea disposal etc). If this is the case, provide reference/licence number for the related marine projects.

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It is the responsibility of the applicant to obtain any other consents or authorisations that may be required.

Under Section 54 of the Marine (Scotland) Act 2010, all information contained within and provided in support of this application will be placed on a Public Register. There are no national security grounds for application information not going on the Register under the 2010 Act.

Public Register

Do you consider that any of the information contained within or provided in support of this application should not be disclosed:

(a) for reasons of national security; YES ☐ NO ■

(b) for reasons of confidentiality of commercial or industrial information where such confidentiality is provided by law to protect a legitimate commercial interest? YES ■ NO ☐

If **YES**, to either (a) or (b), please provide full justification as to why all or part of the information you have provided should be withheld.

Section 5e notes commercially sensitive information i.e. the costs of the work to be carried out.

WARNING

It is an offence under the Act under which this application is made to fail to disclose information or to provide false or misleading information.

Target duration for determination is 14 weeks. Please note that missing or erroneous information in your application and complications resulting from consultation may result in the application being refused or delayed.

Marine licence applications will not be accepted unless accompanied by a cheque for the correct application fee, or if an invoice is requested, until that invoice is settled. Target timelines for determining applications do not begin until the application fee is paid.

Declaration

I declare to the best of my knowledge and belief that the information given in this form and related papers is true.

Signature [redacted] Date 28/03/2017

Name in BLOCK LETTERS Karolis Kairelis

Application Check List

Please check that you provide all relevant information in support of your application, including but not limited to the following:

- Completed and signed application form ☑
- Project Drawings ☐
- Maps/Charts ☑
- Co-ordinates of the boundary points of the area of harbour jurisdiction (if you are a statutory harbour authority) ☐
- Method Statement ☑
- Photographs of the location of the project ☐
- Additional information e.g. consultation correspondence (if applicable) ☑
- Noise Registry – Initial Registration Form (if applicable) ☑
- Pre-application Report (if applicable) ☐
- Environmental Statement (if applicable) ☐
- Payment (if paying by cheque) ☐

1. Applicant Details

Title: Mr Initials: K Surname: Kairelis

Trading Title (if appropriate): Aberdeen Offshore Wind Farm Limited

Address: Aberdeen Offshore Wind Farm Limited, Third Floor, The Tun Building, 4 Jackson's Entry, Holyrood Road, Edinburgh, EH8 8AE

Name of contact (if different):

Telephone No. (inc. dialing code): 02033016456 or [redacted]

Email: karolis.kairelis@vattenfall.com

Statutory Harbour Authority? YES ☐ NO ■

If **YES**, please provide a list of the latitude and longitude co-ordinates (WGS84) of the boundary points of the area of harbour jurisdiction using Appendix 01 Additional Co-ordinates form if necessary.

2. Agent Details (if any)

Title: Dr Initials: S Surname: Lister

Trading Title (if appropriate):

Address: Natural Power, Ochil House, Springkerse Business Park, Stirling, FK7 7XE

Name of contact (if different):

Telephone No. (inc. dialing code): 01970 636869

Email: sarahl@naturalpower.com

3. Payment

Enclosed Cheque ☐ Invoice ■

Contact and address to send invoice to:

Applicant ■ Agent ☐ Other ☐

If **OTHER**, please provide contact details:

Title: Initials: Surname:

Address:

Email:

4. Application Type

Is this application for a new construction site or an existing construction site:

New Site ☐ Existing Site ☒

If an **EXISTING SITE**, please provide the consent/licence number and expiry date:

Consent/Licence Number	**Expiry Date**
Marine Licence Number 04309/13/0 Marine Licence Variation May 2016 04309/16/00 Marine Licence Variation Sept 2016 04309/16/1	Expiry of 04309/16/1 is 31 December 2040

5. Project Details

(a) Brief description of the project (e.g. construction of a new sea outfall):

Unexploded ordnance (UXO) clearance activities within the European Offshore Wind Deployment Centre area.

(b) Total area of the proposed works (in square metres):

22,251,354 m^2

(c) Proposed start date **(Target duration for determination of a marine licence application is 14 weeks):**

15/05/2017

(d) Proposed completion date:

30/09/2018

(e) Cost of the works seawards of the tidal limit of MHWS:

£[redacted]

(f) Location:

European Offshore Wind Deployment Centre including the transmission works as shown in accompanying maps 1-3.

Latitude and Longitude co-ordinates (WGS84) defining the extent of the project (continue on Appendix 01 Additional Co-ordinates form if necessary):

Latitude											**Longitude**										
5	7	°	1	2	.	8	7	0	' N		0	0	2	°	0	3	.	5	9	6	' W
5	7	°	1	2	.	9	9	3	' N		0	0	2	°	0	3	.	5	3	5	' W
5	7	°	1	3	.	0	1	5	' N		0	0	2	°	0	3	.	5	4	8	' W
5	7	°	1	3	.	0	1	7	' N		0	0	2	°	0	3	.	5	4	8	' W
5	7	°	1	3	.	0	1	6	' N		0	0	2	°	0	3	.	5	3	5	' W
5	7	°	1	3	.	0	1	5	' N		0	0	2	°	0	3	.	5	2	8	' W
5	7	°	1	3	.	0	0	5	' N		0	0	2	°	0	3	.	4	5	5	' W
5	7	°	1	3	.	0	1	6	' N		0	0	2	°	0	3	.	3	8	5	' W
5	7	°	1	3	.	0	0	4	' N		0	0	2	°	0	3	.	2	3	2	' W
5	7	°	1	2	.	8	1	2	' N		0	0	2	°	0	2	.	1	1	2	' W

(g) Is the project located within the jurisdiction of a statutory harbour authority?

YES ☐ NO ■

If **YES**, please specify statutory harbour authority:

(h) Method statement including schedule of work (continue on separate sheet if necessary):

AOWFL is currently undertaking a geophysical survey to identify any potential UXOs within the European Offshore Wind Deployment Centre and the transmissions works as identified in the accompanying maps 1-3 of the Marine Licence Application and the Figure 2-1 of the EPS risk assessment. AOWFL are planning to begin to carry out the dedicated UXO clearance activities in May 2017 and the anomaly investigation stage may last between 1 and 6 months depending on the findings of the UXO geophysical survey. Other clearance works to clear rogue UXO may be required during the construction of the offshore wind farm and associated infrastructure, which could take place anytime between Q3 2017 and Q3 2018. In advance of each disposal activity, plans and timings will be shared with the Marine Scotland Licencing and through Notice To Mariners.

Any potential UXO identified by the geophysical survey will be inspected by Remotely Operated Vehicle (ROV) to confirm whether they are UXO and to seek to identify their type and condition. If the target anomaly is buried, a magnetometer sweep will be conducted and should the target item be within range, a small suction pump/waterjet may be utilised to excavate the seabed material around the target anomaly in order to expose it. Any identified UXO will be avoided where possible, by the siting of infrastructure at sufficient distances from the ordnance. It should be noted that the hierarchy of events during the UXO clearance process is that detonation by controlled explosion will be used as a last resort should avoidance or removal not be possible. In the event that a UXO needs to be relocated (i.e. because it cannot be avoided), a remote Enclosed Mine Lifting Bag (EMLB; deployed either by an ROV or a diver) will be used to bring the UXO near the surface and allow it to be towed to an appropriate site. Throughout the tow the UXO will be suspended below the EMLB to minimise fragmentation hazard in the unlikely event of uncontrolled detonation initiation.

To dispose of each UXO, an ROV will place a donor charge (of between 2 and 10 kg) on the target object and then return to the surface. The ignition takes place by means of shock tube (non-electrical ignition), acoustic or detonation cord methods and is triggered remotely from the guard vessel. Only when the ROV has been recovered, the charge has been set up correctly, the ROV support vessel has transited outside the detonation safety radius (1.5 km), and pre-detonation mitigation has been implemented will the actual detonation procedure commence. The smaller guard vessel will then return to the UXO location to initiate the detonation. A 500 m safety zone will be maintained by the guard vessel. Detonations will only take place during daylight hours, in good visibility and in good sea conditions (ideally in sea states of less than or equal to three) to provide good conditions for the pre- and post-detonation searches. Each detonation will take approximately 6-8 hours to complete from when the vessels first arrive to set up the detonation to when the removal of debris is complete and the area is declared safe. Following detonation the UXO area will be re-examined by the ROV to confirm the successful detonation of the UXO. Debris from the UXO will be collected and disposed of in a suitable waste disposal facility.

Further details of these methods are provided in the document that accompanies the Marine Licence application entitled European Offshore Wind Deployment Centre –UXO Clearance Activities - Supporting Information.

(i) Potential impacts the works may have (including details of areas of concern e.g designated conservation and shellfish harvesting areas) and proposed mitigation in response to potential impacts (continue on separate sheet if necessary):

A full Environmental Impact Assessment of the wind farm and transmission works has been undertaken and consented (please see the European Offshore Wind Deployment Centre Environmental Statement July 2011).

An investigation was commissioned in 2016 by AOWFL into the likelihood of encountering different types of UXO within the EOWDC site. Although an assessment had previously been undertaken in 2011 to inform the Environmental Statement for the project, this 2016 report is considered to supersede the information presented within the Environmental Statement. This report identified the different types of UXO that could be most likely encountered within the EOWDC area and proposed that further geophysical survey was required to locate potential UXO hazards in the area.

A geophysical survey (EPS licence number MS EPS 09/2016/02) is being carried out to determine exact details.

The supporting information that accompanies this application assesses the potential impacts of UXO clearance activities on the key receptors agreed with Marine Scotland. Key receptors included physical processes, benthic ecology, fish and shellfish, marine mammals, commercial fisheries, shipping and navigation, marine archaeology and infrastructure and other users. The assessments identified that due to the localised nature of detonations, low number and short duration of any detonation works, all of the receptors would not be significantly affected. The assessment identifies that there is the potential impact of auditory injury to seals and harbour porpoise from the proposed works during the detonation of UXO, should it be required. Therefore, in order to comply with the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) legislation, a European Protected Species (EPS) Risk Assessment has been undertaken that takes into account the marine mammal mitigation plan. This has concluded that there is the potential for auditory injury (PTS) and limited, short term displacement upon cetaceans. As a consequence, the EPS risk assessment and EPS derogation licence have all been submitted as part of, and in tandem with, this application.

6. Deposits and/or Removals

(a) **Permanent** substance(s) or object(s) to be deposited and/or removed from below MHWS (continue on a separate sheet if necessary):

	Deposits		**Removals**	
Type of Deposit/Removal	Description	Quantity & Dimensions (metric)	Description	Quantity & Dimensions (metric)
Steel/Iron		No.		No.
		Dimensions		Dimensions
		Weight (kg/tonnes)		Weight (kg/tonnes)
Timber		No.		No.
		Dimensions		Dimensions
		Weight (kg/tonnes)		Weight (kg/tonnes)
Concrete		No.		No.
		Dimensions		Dimensions
		Weight (kg/tonnes)		Weight (kg/tonnes)
Plastic/Synthetic		m^2		m^2
Clay (< 0.004 mm)		Volume (m^3)		Volume (m^3)
		Weight (kg/tonnes)		Weight (kg/tonnes)
Silt (0.004 ≤ Silt < 0.063 mm)		Volume (m^3)		Volume (m^3)
		Weight (kg/tonnes)		Weight (kg/tonnes)
Sand (0.063 ≤ Sand < 2.0 mm)		Volume (m^3)		Volume (m^3)
		Weight (kg/tonnes)		Weight (kg/tonnes)
Gravel (2.00 ≤ Gravel < 64.0 mm)		Volume (m^3)		Volume (m^3)
		Weight (kg/tonnes)		Weight (kg/tonnes)
Cobbles (64.0 ≤ Cobbles < 256.0 mm)		Volume (m^3)		Volume (m^3)
		Weight (kg/tonnes)		Weight (kg/tonnes)
Boulders (≥ 256.0 mm)		Volume (m^3)		Volume (m^3)
		Weight (kg/tonnes)		Weight (kg/tonnes)

Pipe		Length (m) External Diameter (cm/m)		Length (m) External Diameter (cm/m)
Other (please describe below):				

(b) Method of delivery of substance(s) or object(s):

(c) For work involving salt marsh feeding, beach replenishment or land reclamation please provide the following information relating to the substance(s) or object(s) to be deposited:

Quantity (tonnes):

tonnes

Nature of substance(s) or object(s) (e.g. sand, silt, gravel etc.):

Source (if sea dredged state location of origin)

Particle size:

Have the substance(s) or object(s) been chemically analysed? **YES** ☐ **NO** ☐
If YES, please include the analysis data with your application

(d) **Temporary** substance(s) or object(s) to be deposited below MHWS (continue on a separate sheet if necessary):

Type of Deposit	**Description**	**Quantity & Dimensions** (metric)
Steel/Iron		No.
		Dimensions
		Weight (kg/tonnes)
Timber		No.
		Dimensions
		Weight (kg/tonnes)

Concrete		No.
		Dimensions
		Weight (kg/tonnes)
Plastic/Synthetic		m^2
Clay (< 0.004 mm)		Volume (m^3)
		Weight (kg/tonnes)
Silt (0.004 ≤ Silt < 0.063 mm)		Volume (m^3)
		Weight (kg/tonnes)
Sand (0.063 ≤ Sand < 2.0 mm)		Volume (m^3)
		Weight (kg/tonnes)
Gravel (2.00 ≤ Gravel < 64.0 mm)		Volume (m^3)
		Weight (kg/tonnes)
Cobbles (64.0 ≤ Cobbles < 256.0 mm)		Volume (m^3)
		Weight (kg/tonnes)
Boulders (≥ 256.0 mm)		Volume (m^3)
		Weight (kg/tonnes)
Pipe		Length (m)
		External Diameter (cm/m)
Other (please describe below):		

7. Disposal of Dredged Substance(s) or Object(s) at Sea

(a) Do you intend to apply for a marine licence for sea disposal of dredged substance(s) or object(s) as part of the project? YES ☐ NO ■

If **YES**, please specify nature of substance(s) or object(s) (e.g sand, gravel, silt, clay, rock etc.):

(b) Quantity of substance(s) or object(s) (wet tonnes):

wet tonnes

A separate marine licence application will be required to be submitted for sea disposal.

8. Noise Monitoring

Will loud, low to mid frequency (10Hz to 10kHz) impulsive noise be produced by the project? YES ■ NO ☐

If **YES**, which please indicate the noise generating activities and sound frequencies:

Noise Generating Activity	Sound Frequency (Hertz)
Use of Explosives	2 Hz - 1,000 Hz
Use of Accoustic Deterrent Devices	2,000 Hz - 100,000 Hz
Piling	
Other (please describe below):	
Multi-Beam Echo Sounder	200,000 Hz - 400,000 Hz
Other sonar equipment (Sidescan and ROV sonar to aid visibility in turbid water)	300,000 Hz - 1,200,000 Hz

If you have ticked **YES**, please complete the Noise Registry – Initial Registration form located at:
http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/noise-reduction

Marine licence applications will not be accepted until this form has been completed and submitted.

9. Statutory Consenting Powers

Do you, or (if appropriate) your client, have statutory powers to consent any aspect of this project?

No.

10. Scotland's National Marine Plan

Have you considered the application with reference to Scotland's National Marine Plan? YES ■ NO ☐

If **YES**, provide details of considerations made with reference to the policies, including but not limited to General Policies 7 and 13 (GEN 7 and GEN 13), that have been considered:

This marine licence application is for the clearance and potential detonation of UXO at the consented European Offshore Wind Deployment Centre. The licence is required for health and safety reasons to ensure that during the construction of the wind farm and the offshore transmission works that the site and construction is safe from UXO. European Offshore Wind Deployment Centre application considered Scotland's National Marine Plan, which considers the North East Region as having favourable conditions for marine development, particularly in the offshore wind context.

This application is considered to be in line with the National Marine Plan, which identifies European Offshore Wind Deployment Centre within the Offshore Wind Marine Renewable Energy Map (Map 9 of the plan). Further to this, the application is in line with the objectives and policies for offshore wind and marine renewable energy detailed within Section 11 of the Plan.

If **NO**, please provide an explanation of why you haven't considered the National Marine Plan?

11. Pre-Application Consultation

Is the application subject to pre-application consultation, under The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013? YES ☐ NO ■

If **YES,** please indicate the date of the public notice for the pre-application consultation event and the type of consultation event held (a copy of the public notice must be supplied with this application):

Event Type	Date

12. Consultation

List all bodies you have consulted and provide copies of correspondence:

A telephone call was held with between representatives Natural Power, Aberdeen Offshore Wind Farm Limited and Marine Scotland on 7th of February 2017 to discuss the licence application, the required content of the Supporting Information to the application, the EPS risk assessment requirement and the likely requirement for an EPS derogation licence.

13. Environmental Assessment

(a) Does the project fall under Annex I or II of the EIA Directive?

Annex I ☐ Annex II ☐ Neither ■

If **ANNEX I or ANNEX II**, please provide the screening opinion issued to you in relation to the project.

(b) Has an EIA been undertaken:

for the marine licence application to which this application relates YES ☐ NO ■
for any other EIA regulator (e.g local authority) YES ☐ NO ■

14. Associated Works

Provide details of other related marine projects, including reference/licence numbers (if applicable):

European Offshore Wind Deployment Centre holds the following Marine Licences:
Marine Licence Number 04309/13/0
Marine Licence Variation May 2016 04309/16/00
Marine Licence Variation Sept 2016 04309/16/1

Appendix 01 - Marine Licence Application Additional Co-ordinates

Please use this appendix to provide any additional latitude and longitude co-ordinates (WGS84) for your marine licence application. Please identify the location details and provide exact latitude and longitude co-ordinates (WGS84).

Location (e.g Quay 1 Dredge Area, Example Harbour)	**Latitude**											**Longitude**										
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AWOF UXO Clearance Area	5	7	°	1	5	.	2	4	0	’N		0	0	1	°	5	6	.	8	6	5	’W
AWOF UXO Clearance Area	5	7	°	1	2	.	3	6	0	’N		0	0	1	°	5	8	.	6	8	0	’W
AWOF UXO Clearance Area	5	7	°	1	1	.	8	4	2	’N		0	0	2	°	0	2	.	7	2	1	’W
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Declaration

I declare to the best of my knowledge and belief that the information given in this form and related papers is true.

WARNING

It is an offence under the Act under which this application is made to fail to disclose information or to provide false or misleading information.

Signature [redacted]

Date 28/03/2017

Name in BLOCK LETTERS KAROLIS KAIRELIS

Please check carefully the information you have given

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Project:
Aberdeen Offshore Wind Farm (AOWF)

Title:
UXO Clearance Area
Map 1 of 3

Key

- Development area
- Consented turbine
- Indicative offshore cable route (NB All cable options are shown but only one option will be pursued)
- UXO clearance area

Scale @ A3: 1:10,000

Coordinate System: British National Grid
NOT TO BE USED FOR NAVIGATION

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0 100 200 400 m

Date: 20-03-17	Prepared by: LG	Checked by: SL
Ref: GB201267_M_001_B	WTG Layout LABER045	

Drawing by:

Natural Power Consultants Ltd
The Green House
Forrest Estate, Dalry
Castle Douglas, DG7 3XS, UK
Tel: +44 (0)1644 430008
Fax: +44 (0)845 299 1236
Email: sayhello@naturalpower.com
www.naturalpower.com

natural power

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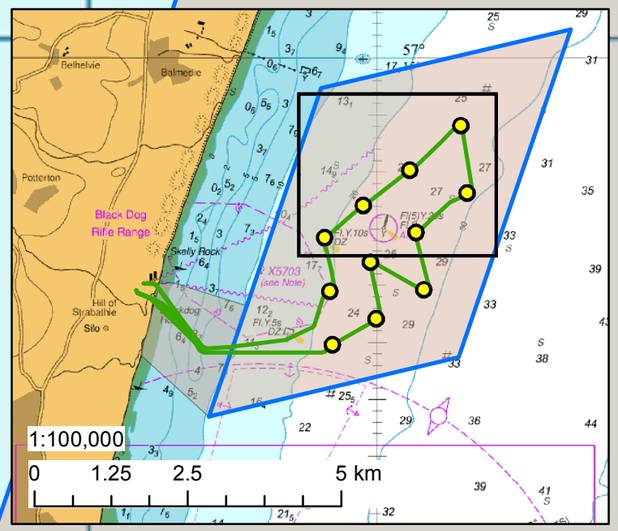

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AWF08

AWF02

AWF07

AWF01

Project:
Aberdeen Offshore Wind Farm (AOWF)

Title:
UXO Clearance Area
Map 2 of 3

Key

- Development area
- Consented turbine
- Indicative offshore cable route (NB All cable options are shown but only one option will be pursued)
- UXO clearance area

Scale @ A3: 1:10,000

Coordinate System: British National Grid
NOT TO BE USED FOR NAVIGATION

0 100 200 400 m

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Date: 20-03-17	Prepared by: LG	Checked by: SL
Ref: GB201267_M_002_B	WTG Layout LABER045	

Drawing by:

Natural Power Consultants Ltd
The Green House
Forrest Estate, Dalry
Castle Douglas, DG7 3XS, UK
Tel: +44 (0)1644 430008
Fax: +44 (0)845 299 1236
Email: sayhello@naturalpower.com
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natural power

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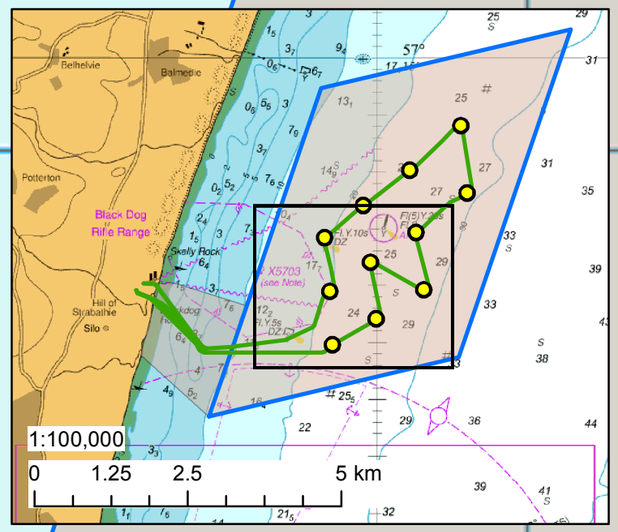

AWF01

AWF05

AWF06

AWF07

AWF09

AWF10

AWF11

Danger Area

Danger Area

Project:

Aberdeen Offshore Wind Farm (AOWF)

Title:

UXO Clearance Area
Map 3 of 3

Key

- Development area
- Consented turbine
- Indicative offshore cable route (NB All cable options are shown but only one option will be pursued)
- UXO clearance area

Scale @ A3: 1:10,000

Coordinate System: British National Grid
NOT TO BE USED FOR NAVIGATION

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Date: 20-03-17	Prepared by: LG	Checked by: SL
Ref: GB201267_M_003_B	WTG Layout LABER045	

Drawing by:

Natural Power Consultants Ltd
The Green House
Forrest Estate, Dalry
Castle Douglas, DG7 3XS, UK
Tel: +44 (0)1644 430008
Fax: +44 (0)845 299 1236
Email: sayhello@naturalpower.com
www.naturalpower.com

natural power

European Offshore Wind Deployment Centre

UXO Clearance Marine Licence

Supporting Information

ABE-CM-DB-0007

28/03/2017

Prepared by:	Sarah Lister	Environmental Consultant (Natural Power)		20/03/2017
	NAME	ROLE		DATE
Reviewed by:	Nancy McLean	Principal Environmental Consultant (Natural Power)		21/03/2017
	NAME	ROLE		DATE
Approved	28.03.2017	00	Adam Ezzamel	[redacted]
STATUS	**DATE**	**REVISION**	**NAME**	**SIGNATURE**

Revision	Date	Revision changes
A	13/03/2017	Draft issue
B	22/03/2017	Final issue

List of Abbreviations and Definitions

Term	Definition / Description
ADD	Acoustic Deterrent Device
AEZ	Archaeological Exclusion Zones
ALARP	As Low As Reasonably Practicable
AOWF	Aberdeen Offshore Wind Farm
AOWFL	Aberdeen Offshore Wind Farm Limited
EMLB	Enclosed Mine Lifting Bag
EOD	Explosive Ordnance Disposal
EOWDC	European Offshore Wind Deployment Centre
EPS	European Protected Species
ES	Environmental Statement
FCS	Favourable Conservation Status
MMO	Marine Mammal Observer
MS-LOT	Marine Scotland Licensing Operations Team
NEQ	Net Explosive Quantity
NTM	Notice To Mariners
ROV	Remotely Operated underwater Vehicle
UXO	UneXploded Ordinance

1 INTRODUCTION

1.1 Background

The European Offshore Wind Deployment Centre (also known as Aberdeen Offshore Wind Farm) has a permitted generating capacity not exceeding 100 MW and comprises of 11 wind turbines, inter-array cabling and export cables to shore, located in Aberdeen Bay, approximately 2 km east of Blackdog, Aberdeenshire.

The European Offshore Wind Deployment Centre (EOWDC) received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 26 March 2013 (the S36 Consent) and was granted a Marine Licence from the Scottish Ministers on 15 August 2014 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

Aberdeen Offshore Wind Farm Limited (AOWFL) is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain, and decommission the European Offshore Wind Deployment Centre.

1.2 Objectives of this Document

This report provides supporting information and accompanies the application for a Marine Licence to undertake unexploded ordnance (UXO) clearance activities within the wind farm boundary (shown as the 'Development Area' shown within the inset map of UXO Clearance Area Maps 1-3).

Natural Power Consultants Ltd (Natural Power) has compiled this report on behalf of AOWFL who will be undertaking/commissioning the UXO clearance work. This document provides a summary on the baseline conditions in Aberdeen Bay regarding key receptors, and a brief summary on the Environmental Impact Assessment (EIA) predictions taken from the ES. In addition, this report describes the impact assessments undertaken for the key receptors and provides an indication of significance of potential impacts that might arise from the works.

AOWFL and its contractors have undertaken desk top studies and geophysical surveys for UXO during the planning application process and since consent was awarded. The latest geophysical survey is ongoing and the works are anticipated to be completed by end of April 2017. The geophysical survey identifies anomalies and some of these anomalies may be classified as potential UXO. These will then be targeted by a more detailed survey by Remotely Operated Vehicle (ROV) to confirm whether or not any identified objects are UXO hazards which would represent a risk to construction activities.

1.3 Introduction

It should be noted that UXO clearance activities will be limited to the wind farm area and the corridor of export cables to shore shown in the accompanying Maps 1-3 as the 'UXO Clearance Area'.

If an object is identified as a UXO hazard, in the first instance AOWFL will seek to avoid any UXO through micrositing of infrastructure. If this is not possible, then AOWFL will seek to physically relocate the UXO from the area of concern if deemed safe to do so. Detonation by controlled explosion will be used as a last resort, should avoidance or relocation not be possible.

AOWFL are planning to carry out the dedicated UXO clearance activities in May 2017 with the anomaly investigation stage lasting between one and six months depending on the findings of the UXO geophysical survey. Other clearance works to clear rogue UXO may be required during the construction of the offshore wind farm and associated infrastructure, which could take place between Q3 2017 and Q3 2018. In advance of each disposal activity, plans and timings will be shared with the Marine Scotland and through Notice To Mariners (NTMs).

The following statements are intended to re-affirm the AOWFL commitment to ensuring that the Development is constructed and operated in such a manner as to meet the relevant legislative requirements set out by the project consents, but also broader legislative requirements. This document identifies the potential impacts of the proposed UXO clearance activities and provides impact assessments for relevant receptor groups. These assessments are deemed to be relevant for clearance of the potential UXO hazards identified during pre-construction works, as well as any potential 'rogue' UXO encountered during construction, such that any risk to subsequent construction activities can be removed.

In addition, the requirement to consider European Protected Species (EPS) in developments in waters off Scotland derives from the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) which transpose the requirements of the Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora). As such, the Marine Licence application will be submitted in tandem with an application to MS-LOT for an EPS Derogation Licence for the same works. The EPS Risk Assessment that accompanies the EPS Derogation Licence application is also presented as Appendix A of this document for ease of reference.

1.4 Consultation

Initial consultations on proposed UXO clearance activity were held via telephone on the 7th of February 2017 between AOWFL/Natural Power staff and MS-LOT. The outcome of this consultation provided the scope of the assessment to be undertaken, and the production of a mitigation plan (see Section 7 of the EPS Risk Assessment that is submitted with the EPS Licence Application and also presented as Appendix A of this document).

Noise data for these works has been submitted to the Marine Noise Registry as part of the Marine Licence application and a Marine Noise Registry close-out report (https://mnr.jncc.gov.uk/) will also be completed once works are completed in accordance with JNCC guidelines.

1.5 Description of Proposed Works

This section provides a description of the UXO clearance activities proposed, including:

- The roles and responsibilities of the key parties involved;
- The background to the clearance activity;
- The number, size and broad location of UXO that may be potentially found; and
- The activities that are licensable under the Marine (Scotland) Act, 2010.

1.5.1 Roles and Responsibilities

The parties involved in the UXO clearance works are the following:

- AOWFL – Applicant responsible for the commission of works and the construction of the wind farm.
- Ordtek Ltd – UXO consultants responsible for the provision of advice to AOWFL in relation to UXO mitigation.
- Boskalis Offshore – EPCI contractor for the wind farm who holds the responsibility of surveying, identifying and investigating potential UXOs
- To be confirmed – contractors responsible for the identification and disposal of UXO. Tendering process is ongoing.

1.5.2 Potential for UXO

The likelihood of encountering different types of UXO within the EOWDC site was assessed in 2016[1]. Although an assessment had previously been undertaken in 2011 to inform the Environmental Statement for the project, this 2016 report is considered to supersede the information presented within the Environmental Statement.

This 2016 assessment reported on baseline risk and took into account the probability of encountering each type of UXO within the EOWDC site given environmental conditions (movement due to tidal currents, partial or complete burial and coverage by sediment, exposure by scour etc.) and the probability of detonation as a result from different construction related activities.

The desk based assessment reports that the types of UXO that could be most likely encountered within the EOWDC area include:

- German World War I buoyant mines: It is likely that less than 50 were laid across the site during the conflict, and some could have broken loose from moorings and remain on the sea bed; and
- Projectiles: These could have originated from the Blackdog Links Ranges, which have been operational since at least 1940, and which partially overlap the site boundary. There were also at least five Heavy Anti-Aircraft gun and rocket batteries within range of the

[1] *Unexploded Ordnance Risk Profiling with Risk Mitigation Strategy for AOWF*. Ordtek Ltd (March 2016)

site, whose operation may have contaminated the site with projectiles during World War I and II.

- German and Allied High Explosive (HE) bombs: During World War II, German aircraft frequently attacked ships approaching and leaving Aberdeen. In addition, some bombs intended for Aberdeen City fell into the sea or were jettisoned deliberately by returning Allied aircraft.

Given the risks identified by Ordtek, the mitigation proposed included further geophysical survey to locate large net explosive quantity items of UXO. This survey is ongoing and the survey data will be processed and quality assured resulting in identification of a number of anomalies which model as potential UXO. The exact number, type and location of those remaining potential or confirmed UXO items which require clearance will then be confirmed with MS-LOT to see whether the worst case scenario proposed below is still deemed appropriate.

In accordance with the mitigation identified within the report, any anomalies identified as potential UXO will be avoided in the first instance or investigated and/or relocated/destroyed. To avoid delay to the programme of construction, we have used the reported likelihood of encounter and the location of buoyant mine lays and firing areas, to propose the following worst case and most likely scenarios identified for assessment:

- Most likely scenario: Up to five UXO that need to be cleared/detonated. These could be German World War I buoyant mines and High Explosive bombs arising from World War II. Ordtek has classified these as 'very likely' or 'likely' to be encountered and to have between 50-500kg Net Explosive Quantity (NEQ), although 50 -70 kg bombs are likely to predominate. Projectiles likely to be encountered in the site are to be relatively small calibre shells of 2-5kg NEQ.
- Worst case scenario: The identification of up to 20 UXO that need to be cleared/detonated. These could be British World War II buoyant mine, parachute mines, German World War I buoyant mines and High Explosive bombs or projectiles arising from World War II. Estimated worst case is that the largest amount of NEQ to be detonated is approximately 700 kg (German GC mines) however, the Ordtek report classifies the likelihood of encountering this type of UXO as 'very unlikely').

As previously mentioned, a pre-clearance geophysical UXO survey[2] is ongoing to detect and identify anomalies and therefore inform any potential UXO clearance targets. The results of this survey can be made available once the survey has been completed and reported on.

1.5.3 UXO Clearance Licensable Activities

The process for UXO clearance and disposal will take place during four distinct phases as set out below:

1. Ongoing geophysical survey will identify anomalies that could be potential UXO.

[2] EPS licence number MS EPS 09/2016/02

2. UXO investigation and verification – if any anomalies that interpreted as possible UXO cannot be avoided, then they need further investigation to verify whether they are UXO.
3. Items that are confirmed as UXO through investigation and verification will need to be rendered safe by clearance/detonation that will occur prior to offshore construction commencement.
4. Items previously not identified ("rogue" UXO) and discovered during the course of construction that will require action at short notice.

The Contractors responsible for UXO clearance and disposal may differ between the different phases of the project and therefore there may be minor differences in the detailed methodology. The methodologies outlined in this document, however, are considered to be sufficiently broad to cover all possible methods. The methods are therefore considered appropriate for the purposes of the Marine Licence application, and mitigation plan associated with the EPS Licence application, to cover both periods identified above.

UXO Survey and Identification

A geophysical survey is undergoing to examine the seabed for potential UXO across the EOWDC. The location within which inspection and clearance of possible UXO will take place is shown in the accompanying Maps 1-3. UXO survey data will be processed and quality assured resulting in identification of a number of anomalies which model as potential UXO.

UXO Investigation and Verification

Inspections will then take place on those anomalies.. Subject to the nature and location of the anomaly as well as environmental and safety constraints and limitations, investigations may be undertaken by divers or ROV. Both ROVs and divers are usually equipped with some form of corroborative survey equipment or, in the case of ROV sidescan sonar and/or gradiometers and a dredge capacity to uncover buried targets. Once investigated, the targets can be verified as either UXO or non-UXO by a UXO specialist. The investigation works are planned to start in May 2017 and last between one and six months depending on the number of potential UXOs identified in the processing of the geophysical data.

The ROV accommodates mounted non-intrusive dredging pumps to be used to uncover any buried potential UXO items. The dredged volume depends on the item burial depth. As an estimate, if a UXO item position is accurate and is buried not more than 1 m (nearest point of the UXO item to seabed level), the expected dredge volume to ensure stable slopes and full uncovering, would be up to 20 m^3. The material would be temporarily deposited on the seabed close to the excavation pit and if necessary the pit to be backfilled with the same material.

UXO burial risk assessment concludes that partial UXO burial is very likely across the whole EOWDC site. Within the main array site, burial in sandy areas is most likely to be just a few centimetres and not more than 1 m. There is a the potential for UXO to be buried up to 3 m in the export cable route as it crosses the band of coarser grained sediments and megaripples.

However, in these locations we would anticipate to mitigate the UXO risk with appropriate cable route engineering and micro-siting.

The exact number, type and location of those remaining potential or confirmed UXO items which require clearance will then be confirmed with MS-LOT to provide evidence that the worst case scenario assessed is still deemed appropriate.

UXO Clearance

The UXO investigations are planned to start in May 2017 and last between one and six months.. AOWFL are planning to carry out dedicated UXO clearance activities in May 2017, and actual UXO clearance activities could to take in the order of 20 non-consecutive days (not including weather delays). If 'rogue' UXO are discovered, isolated activities could potentially continue through to completion of construction planned for Q3 2018. The number, size and locations of any UXO to be cleared by detonation will be confirmed with MS-LOT following the geophysical survey and prior to any clearance activities.

A description of the type of vessels and equipment to be used during UXO clearance activities is provided in Table 1-1. The licensable activities that are the subject of the Marine Licence application are presented in Table 1-2. It should be noted that the hierarchy of events during the UXO clearance process is that detonation by controlled explosion will be used as a last resort, should avoidance or removal not be possible.

Table 1-1: Vessels and Equipment

Vessel/Equipment Type	Description
ROV/Dive Support Vessel	Placement of the donor charge is made by the project based ROV support vessel and directly using the ROV. The Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring (PAM) Operator will be stationed on board the ROV support vessel, which will be located approximately 100 m from the source during the entire pre-detonation search period. The ROV (see below) will place the charge and then be stored on board the ROV support vessel. The ROV support vessel will then retreat to a distance of 1,500 m (1.5 km) once the one hour pre-detonation search period has been completed by the MMOs. The ROV support vessel will then maintain a 1,500 m navigational safety zone to assist the guard vessel in preventing other vessels from approaching the detonation location until the area is declared safe.
Remotely Operated Vehicle (ROV) The working class ROV system is capable of performing ROV surveys, UXO target investigation, and UXO clearance	The ROV or diver will place the donor charge on the target object and then return to the surface. Demolitions will be performed by means of bulk charge using plastic explosives approved for civilian use. The ignition takes place by means of shock tube (non-electrical ignition), acoustic or detonation cord methods and is triggered remotely from the guard vessel (see below). Only when the ROV/diver has been recovered, the charge has been set up correctly, the ROV support vessel has transited outside the detonation safety radius (1.5 km), and pre-detonation mitigation has been implemented will the actual detonation procedure commence.
Guard Vessel	To secure the blast site and to undertake the detonation, a guard vessel will be present approximately 100 m from the target location. The guard vessel will maintain a detonation safety zone set at 500 m to prevent other vessels from approaching the target location (including all other vessels involved in the UXO activities). Preparation and implementation of the detonation will be stopped if any vessel (with the exception of vessels conducting detonation operations) enters or appears to approach the navigational safety distance of 1,500 m around the blast site maintained by the ROV support vessel. The area will also be closed down for normal marine vessel traffic in close liaison with the National Maritime Operations Centre of HM Coastguard. Only once confirmation that the blast site is clear from other marine traffic and the all clear is given by the guard vessel can preparation for detonation begin. Prior to detonation and post MMO watches conducted from the ROV support vessel, personnel on the guard vessel (stationed at 100 m from the target location) will deploy an Acoustic Deterrent Device (ADD) for 30 mins. This activity will be followed by several 'soft start' charges which increase in size over a 15 minute period as part of the mitigation plan outlined in the EPS Licence Application for these works (see Section 7 of the EPS Risk Assessment in Appendix A of this document.

Table 1-2: Licensable activities

Activity	Description
Identification and verification of potential UXO	AOWFLs preference for initial inspection is by ROV with reconnaissance undertaken by video and sonar recording equipment. If the anomaly is at the seabed surface and the underwater visibility permits, a positive identification will be attempted. If the anomaly is buried, a magnetometer sweep will be conducted and should the item be within range, a small suction pump/waterjet may be utilised to excavate the seabed material around the anomaly in order to expose it. Should a positive identification still not be possible, then Explosive Ordnance Disposal (EOD) experienced divers may be deployed to confirm a UXO and identify the type. Once UXO has been confirmed, the HM Coastguard will be contacted and informed of the location and type of UXO found.
Relocation of non-UXO	In the event a target is identified as non-UXO, the Explosive Ordnance Disposal (EOD) expert will classify it as such. At that point a decision will be made regarding the threat of the object to construction activities and the object will either be left in situ or relocated. This may be through re-location on the seabed at a pre-determined lay down area or through recovery to the vessel with subsequent disposal at an onshore disposal facility. In both instances, the non-UXO item will be recovered to the deck of the vessel for transport, depending on the size and weight of the target. Items relocated to the seabed will have their coordinates logged. Waste disposal onshore will be undertaken by a suitably registered and licensed contractor. The intention is to not recover any UXO to the deck unless absolutely necessary and confirmed as such by the EOD expert.
Clearance of UXO using explosives	It is expected that UXO disposal will predominately be through the use of explosives. This may either be conducted in-situ at the location where the item was discovered or, if safe to do so, moved to a predetermined position for disposal. Confirmed UXO objects for which disposal is planned fall into one of three categories: **Category A**: Confirmed UXO which are to be disposed of by high-order detonation in-situ utilising a donor charge (used to detonate the UXO) of between 2 and 10 kg[3]. If a decision is made to detonate in situ, the site will be secured and a safety exclusion zone of not less than 1.5 km radius will be imposed. This exclusion zone is designed to ensure that personnel and vessels are protected during the controlled detonation. NTM will be posted in advance. Guard vessels will also be deployed if required. The safety exclusion zone has been set at a conservative distance which will be sufficient to account for the presence of larger items of UXO, should these be discovered. MMOs, using visual and/or acoustic surveillance, will be employed to ensure that marine mammals are not present within a 1 km mitigation safety exclusion zone.

[3] Soft start charges will be used of between 0.05 – 0.25 kg prior to the donor change detonation. These soft start charges form part of the mitigation strategy, and together with the use of ADDs, ensure marine mammals are encouraged to leave the area prior to the donor charge detonation.

Activity	Description
	In advance of each disposal activity, plans and timings will be shared with the MS-LOT and through NTMs. Prior to the planned detonation time a security message will be transmitted on VHF Channel 16 stating vessel name, position of firing and planned time (at least six hours before the detonation). The same message will be transmitted again 30 minutes and 10 minutes prior to the detonation again on VHF Ch16. The final 10 seconds leading up to the detonation will also be transmitted on VHF Ch16.The method used to detonate the devices will utilise a donor charge which will be detonated using either an acoustic method, detonation cord or shock tube method. The different methods of detonation all follow the same principle of using a donor charge, it is simply the placement and how the charges are fired that differs. Detonation will take place during daylight hours, only during favourable weather conditions, typically those associated with Sea State three or below. Each detonation will take approximately 6-8 hours to complete from when the vessels first arrive to set up the detonation to when the removal of debris is complete and the area is declared safe. Therefore, it is anticipated that only a single detonation will be completed in single 24 hour period. **Category B**: Confirmed UXO which are to be relocated and disposed of by high-order detonation (again between 2 – 10 kg) together with other confirmed UXO also relocated to the same location. Only small UXO of up to 50 kg would be disposed of in this manner, with the total being in the range of 250 kg (i.e. 10 x 25 kg, or 5 x 50 kg). The UXO consultant may request to relocate a target once its identity has been confirmed and it has been determined that it is safe for transport. Lifting of the target will either be undertaken with the ROV manipulators using a basket or using a remote Enclosed Mine Lifting Bag (EMLB) to bring the UXO near the surface and allow it to be towed. Throughout the tow the UXO will be suspended below the EMLB. The likelihood of an inadvertent UXO detonation will be reduced to As Low As Reasonably Practicable (ALARP) through careful planning and control. A full precautionary safety cordon of 1-2 km will be imposed throughout the relocation process. The coordinates of relocated items will be logged. Once all relocated items have been placed and before detonation is undertaken a survey will be conducted of the investigated area to confirm there are no other objects or anomalies which may also be unidentified UXO and require detonation. Once the secondary location has been reached, the same precautionary measures will take place as set out for UXO detonation. The secondary location will be within the UXO Clearance Area and decided on a case-by-case basis in consultation with the MS-LOT. **Category C**: Confirmed UXO, which are to be recovered onto the vessel and brought ashore for alternative disposal by the contractor. The disposal of transportable UXO will be executed in a destruction facility on land. However, the intention is to not recover any UXO to the deck unless absolutely necessary and confirmed as such by the EOD expert.
Removal of debris	After a detonation has been completed and to confirm if it has been successful, a grid of 10 m x 10 m centred around the detonation site will be surveyed by the ROV. Fragmentation scrap with dimensions > 0.3 m from the confirmed UXO or fragmentation scraps which may contain a

Activity	Description
	section of explosive material from the confirmed UXO will be recovered. All scrap will be recovered to deck and checked and certified as Free From Explosive (FFE) by the UXO consultant. All certified scrap will be taken ashore and disposed of by a suitably registered and licensed contractor.

2 IMPACT ASSESSMENTS

2.1 Approach

The following section is divided into different technical specialities and provides a brief description of the existing environment within which EOWDC is located and then also assesses the potential impacts of the UXO clearance activities in relation to the following environmental topics:

- Physical Processes;
- Benthic Ecology;
- Migratory Fish;
- Fish and Shellfish,
- Marine Mammals;
- Commercial Fisheries;
- Shipping and Navigation;
- Marine Archaeology; and
- Infrastructure and Other Users.

Details on the potential impacts on designated sites will be covered in the different technical sections below, where necessary. Each assessment concludes whether the UXO clearance activities are likely to result in significant or non-significant effects on the key receptors considered.

2.2 Physical Process

2.2.1 Existing Environment and ES Findings

The Environmental Statement for the EOWDC[4] describes the existing coastal processes of the location as of tidal range within 3.4 m and 1.7 m. The most frequently occurring waves within the site (based on observations made during a five month winter survey) are between 0.5 and 1.0 m significant wave height and originate from the southeast. The largest wave heights recorded within this period are of the order of 5.5 m and originate from the east. Further offshore, due to the absence of coastal sheltering, northerly wave directions predominate. Within the site, the seabed material has been observed to be predominantly sand with some mud and gravel in places. The presence of different size fractions acts to provide some armouring to the seabed. The ES describes that both tidal and wave processes influence sediment mobility, with tides having a greater influence offshore. Analysis of tidal currents measured near the seabed shows that tidal asymmetry within the lower water column results

[4] European Offshore Wind Deployment Centre Environmental Statement (2011)

in a net northerly transport of the typically present sand sized sediment. However, the seabed sediment transport regime within the wind farm boundary is not particularly active with respect to these size fractions. The net direction of longshore transport has been shown to be in a northerly direction and under the control of waves (the more frequent waves originate from the southeast). This is evidenced by the rivers that have typically been deflected to the north due to the sediment deposition at the mouths. Under extreme storm events, the potential alongshore transport potential is much greater in the north of Aberdeen Bay than the south.

The impact assessment for the wind farm concluded that for the construction and operational phases of the wind farm, the majority of potential impacts are considered to be of negligible significance. Exceptions are scour development, short term changes to suspended sediment concentrations and subsequent localised deposition, and slight changes in the coastal response to naturally occurring storm events, which are all considered to be of minor significance.

2.2.2 Assessment of Potential Impacts of UXO Clearance Activities

For UXO verification activities, sediment concentrations may increase when using the suction pump/waterjet to excavate the seabed material around an anomaly in order to expose it, For UXO clearance activities, and in particular if any detonation is to occur, there is likely to be an increase in suspended sediment concentrations within the vicinity of the detonation location due to the blast mobilising sediment into the water column. Craters can also be created as a result of the detonation. The duration of the disturbance during detonation will be instantaneous (very short duration) and once the detonation has completed, the sediment will immediately start to re-settle on the seabed. The effect will be localised to the blast site (a worst case 750 kg explosive could create a crater size of 3 m x 6 m) and with an estimated maximum of 20 UXO detonations, the total area affected will be small in the context of the wider area. The disturbance may result in localised increases of suspended sediment concentrations above that of background concentrations, but it is unlikely to be of the magnitude experienced during storm events. In addition, any craters created are expected to backfill by natural processes as a result of storm events and natural sediment transport regimes. It is also worth noting that the donor charges used to detonate the UXO will not create a crater in instances where the UXO fails to detonate but is still made safe.

As such, although UXO clearance activities may lead to physical disturbance and suspended sediment concentrations and deposition as a result of the detonation process, due to the localised nature of the detonations (as opposed to building a whole wind farm) and low number and short term duration with which the detonation occurs, the effects of the UXO clearance activities are not considered to be significant.

2.3 Migratory Fish

2.3.1 Existing Environment and ES Findings

The Environmental Statement for the EOWDC[3] identified that the Development area may be used by a number of migratory fish on route to or from their natal rivers, including Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), Allis shad (*Alosa alosa*), twaite shad (*Alosa fallax*), sparling (smelt) (*Osmerus eperlanus*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and European eel (*Anguilla anguilla*). It was considered that migratory species on their way to or from the rivers Ugie, Ythan, Don, Dee and Esk may pass near the European Offshore Wind Deployment Centre (EOWDC) as they migrate through Aberdeen bay.

In addition, a number of rivers designated as Special Area of Conservation (SAC) partly due to having migratory fish as qualifying species which had potential connectivity to the project were identified (Table 2-1).

Table 2-1: SAC's with migratory fish as a qualifying feature on the Scottish East Coast

River	Qualifying features	Migratory Fish Species as qualifying features	Distance from project area to river mouth (km)
River Dee	Atlantic salmon Freshwater pearl mussel Otter	Atlantic salmon	5
River South Esk	Atlantic salmon Freshwater pearl mussel	Atlantic salmon	55
River Tay	Atlantic salmon Brook lamprey River lamprey Sea lamprey Otter	Atlantic salmon Sea lamprey River lamprey	95
River Tweed	Atlantic salmon Brook lamprey River lamprey Sea lamprey	Atlantic salmon Sea lamprey River lamprey	125
River Teith	Atlantic salmon River lamprey Sea lamprey	Atlantic salmon Sea lamprey River lamprey	150

During the EIA the impact of noise and of increased sediment concentrations were assessed for adult and juvenile salmon and sea trout, and both were found to have negligible, and therefore non-significant effects[5].

No assessment of other migratory fish species was undertaken specifically within the Salmon and Sea Trout chapter, rather it is assumed that other species were assessed under the scope of the marine fish assessment.

[5] European Offshore Wind Deployment Centre Environmental Statement (2011)

2.3.2 Assessment of Potential Impacts of UXO Clearance Activities

The impact of UXO clearance activities on migratory fish is primarily considered to be related to the high noise levels produced by any detonation associated with the clearance works. Vessel traffic also may elevate noise levels at the wind farm area. However, any vessel noise associated with UXO clearance work is considered to be within, or less than, that is typically associated with normal vessel traffic in the area and therefore not significant. Increased suspended sediments may arise following UXO clearance, however increases from such discreet activities are likely to be far lower than those assessed during the EIA for construction activities and as such this impact is considered to be non-significant and not assessed further.

High noise levels associated with UXO clearance through detonations may have the following effects on migratory fish species:

- Injury or mortality to any individuals within close proximity of the blast; and
- Disturbance and displacement of any individuals immediately outwith the area of injury;

Pressure waves from explosives dissipate very quickly in water, and although it is possible that some mortality or injury may occur during any detonations, the area over which this effect may occur is anticipated to be small.

Disturbance or displacement effects will only occur over very short timeframes. UXO detonations will only cause discreet disturbance event (each detonation results in only a single noise event, and no more than 20 detonation events are planned) and the initial dedicated pre-construction clearance campaign is anticipated to take no longer than 20 days (weather permitting).

As identified above, migratory fish species may be present in the area during the UXO clearance operations, and as such an assessment of the effects of UXO clearance on those species has been undertaken below.

Lamprey species

These species are not common in the marine environment (more often found in and around estuaries and upriver environments), however they are known to be present in local rivers and as such there is potential for this species to be in the area of the works. The likelihood, however, that any individuals will be present within the very small area of lethal or injurious effects is considered extremely low and therefore no significant impacts are predicted.

Lampreys are one of the most primitive extant invertebrate species and although they have the potential to use sound (they have a primitive inner ear structure), they are not hearing specialists and it is considered likely that much of the pressure component of a sound wave would have attenuated before making it to the ear structure[6]. In addition, considering their

[6] Popper, A.N. 2005. A Review of Hearing by Sturgeon and Lamprey. Environmental BioAcoustics, LLC Rockville, MD 20853

limited behavioural range, although they may use sound to build a picture of the environment, it is considered possible that sound does not influence their behaviour at all[7]. As such, no disturbance or displacement effects are considered likely for Lamprey species in response to the UXO clearance works, and any impact on Lampreys is considered to be not-significant.

Allis and Twaite Shad

Both species of shad are classed as scarce in UK waters (i.e. a species with significantly less than average population level). As neither Allis nor Twaite shad spawn in any of the local rivers[8], no individuals of this species are predicted to be present in the local area and as such no impacts are predicted on this species.

Sparling

Although once relatively widespread in rivers around Scotland, the breeding status of the sparling is now extremely restricted in Scottish rivers (Cree, Forth and Tay).The Tay is approximately 95 km from the development area so there is predicted to be no connectivity between key habitats of this species and the UXO clearance works. As the incidence of this species in UK waters is extremely low, it is deemed highly unlikely that there will be any interaction between this species and the UXO clearance works and as such, no impacts are predicted on this species.

Atlantic Salmon

On returning to their natal rivers, Atlantic salmon originating in rivers from Aberdeenshire are thought to migrate back from their feeding grounds through the North Sea, approaching the coast as far south as Northumberland and then starting a northerly coastal migration towards their home rivers[9]. Therefore, any Salmon traveling to rivers located south of the development area are assumed to approach from a southerly direction and will not pass through the development area on migration to their natal rivers. Migration routes of salmon returning to rivers north of Peterhead/Aberdeenshire are more variable, but are likely to be from a northerly direction[10]. The incidence of salmon migrating through the project area is therefore predicted to be low, due to the variable (and more southerly) direction of migration to rivers to the north of the project area, and northerly migration to rivers to the south of the project area.

Numbers of migrating salmon are likely to be greatest during the late spring and summer months. All catches by net in the area (when permitted) takes place between February and

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[7] European Offshore Wind Deployment Centre Environmental Statement (2011)

[8] Ibid.

[9] Malcolm, I.A., Godfrey, J. and Youngson, A.F. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: Implications for the development of marine renewable. Environmental Research Institute, Thurso. Published by Marine Scotland Science. ISSN:2043-7722.

[10] European Offshore Wind Deployment Centre Environmental Statement (2011)

September, peak catches for Salmon are between May and August, and peak catches for sea trout are between May and July. Adult salmon which have spawned (kelts) could be moving out to sea in the autumn or winter, and post-smolt fish may exit the rivers at any time of year.

Atlantic salmon are known to use the following rivers in the vicinity of the Project; Ugie, Ythan, Don, Dee and Esk, and as such have the potential to be present in the area. Currently, commercial salmon netting is banned in the Don district, however before the ban was in force catches were often low (e.g. 0-6 fish per year between 2000-2009 by net and cobble in the river Ythan area), even in the peak season, highlighting the low spatial density of Atlantic Salmon when they are in the marine environment[11]. As such, the likelihood of large numbers of fish being within the area of lethal or injurious effects is very low, and any pre detonation activity of inspections by diver and or ROV, and of attaching a charge to the UXO, is likely to cause any fish move out of the immediate area, thereby displacing them from the vicinity of the blast. As such, any lethal or injurious effects are considered to be highly localised, minimal, and will not affect populations; and are therefore not considered to be significant.

New research on the behavioural responses of Salmon to noise found that even very loud activities (i.e. piling) did not lead to significant avoidance behaviour[12]. These experiments were carried out with captive Atlantic salmon, which have been determined to have similar hearing abilities of wild Atlantic salmon, during which Atlantic salmon were exposed to real piling noise in a dock filled with seawater. UXO clearance works can produce sound intensities similar to those produced during piling, and as such it is considered that very limited, if any, behavioural responses will occur in any Atlantic salmon in proximity to the works. Therefore, no significant impacts are predicted due to displacement and disturbance effects during UXO clearance work.

Sea Trout

Sea trout hatch in fresh water and after about three years, smolt and migrate downriver to the sea. Once at sea they feed voraciously putting on weight in direct relationship to the amount of food available. Some sea trout return to rivers after only one summer at sea, on reaching a size of about 2 kg or more, while others may spend longer at sea, perhaps three or four years, before returning for the first time. On returning they may spawn, or sometimes go back down to the sea without spawning.

Sea trout smolts migrate from their natal rivers seawards in the spring, generally from April to June. The seaward migration is thought to be an active process with fish swimming close to

[11] Don District Salmon Fishery Board, (2016) Statutory Annual Report, October 2016. http://www.river-don.org/documents/DonDSFBStatutoryAnnualReport2016.pdf

[12] Harding, H., Bruintjes, B., Radford, A.N., and Simpson, S.D. 2016. Measurement of Hearing in the Atlantic salmon (salmo salar) using Auditory Evoked Potentials, and effects of Pile Driving Playback on salmon Behaviour and Physiology. Scottish Marine and Freshwater Science Vol. 7 (11). ISSN: 2043-7722

the surface of the river and there does not appear to be a period of acclimation when moving from fresh to salt water. Sea trout post-smolts are not believed to travel to distant waters to feed; instead they generally remain in coastal waters. In the North East region sea trout generally enter the rivers from June to September with peak runs varying between rivers[13].

Sea trout are known to be present in the following rivers in the vicinity of EOWDC; Ugie, Ythan, Don, Dee and Esk, and as such have the potential to be present in the area. As with Atlantic Salmon, commercial netting for sea trout is banned in the Don district, however even before the ban was in force catches were often low (e.g. between 0-56 fish captured per year by net and cobble in the river Ythan area), highlighting the relatively low spatial density of sea trout when they are in the marine environment[14].

The likelihood of large numbers of fish being within the area of lethal or injurious effects is very low, and any pre detonation activity of inspections by diver and or ROV, and of attaching a charge to the UXO, is likely to cause any fish move out of the immediate area, thereby displacing them from the vicinity of the blast. As such, any effects are considered to be highly localised, minimal, and will not affect populations; and are therefore not considered to be significant.

Sea trout are considered to be less sensitive to sound than Atlantic salmon[15], and in studies on the behavioural reactions of sea trout to high intensity sound sources (i.e. pile driving) no behavioural responses were observed even in fish located just 400m from the sound source[16]. As such, due to a lack of sensitivity, no significant impacts to sea trout are predicted due to disturbance and displacement effects from UXO clearance activities.

Assessment of SAC connectivity – Migratory Fish

Physical effects on fish are only predicted to occur within a few hundred meters of the works, beyond which it is only behavioural responses that may occur. The species of fish listed as features of nearby SAC's include river and sea lamprey, and Atlantic salmon (Table 2-1). As described above, due to the relatively low density of these species in the marine environment, the likelihood of physical injury or lethal effects from elevated noise levels is extremely low, and as such no significant effects are predicted.

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[13] European Offshore Wind Deployment Centre Environmental Statement (2011)

[14] Ibid.

[15] Nedwell, J.R., Langworthy, J. and Howell, D. 2003. Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore windfarms, and comparison with background noise. Subacoustech Report ref: 544R0423, published by COWRIE.

[16] Nedwell, J.R., Parvin, S.J., Brooker, A.G. and Lambert, D.R. 2008. Modelling and measurement of underwater noise associated with the proposed Port of Southampton capital dredge and redevelopment of berths 201/202 and assessment of the disturbance to salmon. Subacoustech Report No. 805R0444.

The migration routes of Atlantic salmon described in Malcom *et al.,* (2010)[17] indicates any Salmon traveling to the river Dee (or any other SAC river located south of the development area) are assumed to approach from a southerly direction and therefore not pass through the development area on migration to their natal rivers. Migration routes of salmon returning to the river ESK or those SAC rivers to the north of the development area are more variable, but are likely to be from a northerly direction[18]. Atlantic salmon migrating to SAC rivers are therefore unlikely to be effected by the UXO clearance works.

Lamprey species are not considered sensitive to sound and as such no impacts arising from disturbance and displacement effects are predicted on these species. Atlantic salmon have been shown not to show any significant behavioural responses to high intensity sound, and as such very limited, if any, behavioural responses will occur in any Atlantic salmon which are in the vicinity of the works.

All SAC rivers with migratory fish as qualifying features are located at least 5 km away from the project area, therefore no significant effects are predicted on SAC migratory fish species entering or leaving their natal rivers. In addition, due to the location of the project and the general low density of these species in the marine environment, no significant effects are predicted on SAC migratory fish species when within the marine environment.

Conclusion

The impact of UXO clearance on migratory fish was primarily considered to be related to the high noise levels produced by the works. The high noise levels are considered to have the potential to lead to:

- Injury or mortality to any individuals within close proximity of the blast; and
- Disturbance and displacement of any individuals immediately outwith the area of injury;

The assessment concluded that there will be no significant impacts predicted on migratory fish species as a result of UXO clearance works.

2.4 Benthic Ecology

2.4.1 Existing Environment and ES Findings

The baseline assessment for the EOWDC[19] states that the benthic habitat local to the development is widely characterised by homogenous sediments with graduation related to depth and distance from shore. The inshore area was dominated by medium-fine well-sorted

[17] Malcolm, I.A., Godfrey, J. and Youngson, A.F. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: Implications for the development of marine renewable. Environmental Research Institute, Thurso. Published by Marine Scotland Science. ISSN:2043-7722.

[18] European Offshore Wind Deployment Centre Environmental Statement (2011)

[19] Ibid.

sands, although further offshore the habitats were dominated by fine to very fine muddy sands.

Lower species' numbers and abundance's were found in the infaunal community of the inshore shallower areas, where the polychaetes *Nephtys cirrosa* and amphipods dominate. Higher numbers of species and abundance were present further offshore, where the polychaetes *Notomastus latericeus*, the bivalves *Nucula nitidosa* and *Tellina fabula* and brittle stars *Ophiura* spp. dominated the community. These two communities are described by the two biotopes: SS.SSA.IFiSa.NcirBat (inshore) and SS.SSA.CMuSa.AalbNuc (offshore).

Contaminated sediment surveys were carried out in the EOWDC development area to inform the EIA in 2010[20]. Concentrations of the contaminants present were found to be either below detection limits (as for PAH, PCB and organotin compounds) or below international benchmarks (ISQG and PEL) and as such there were no areas of concern. This confirmed the findings of previous studies (e.g. FRS, 2006)[21] that the sediment contamination in the proposed EOWDC site is in line with the background contamination levels for the North-eastern Atlantic area[22].

No statutory designated marine protected areas have been identified within the development area[3].

Impacts on the benthic and epibenthic communities were assessed in the Marine Ecology, Intertidal Ecology, Sediment and Water Quality ES chapter. This chapter considered the following impacts:

- Release of toxic material;
- Sediment disturbance;
- Re-suspension and re-deposition;
- Vibrations and Electromagnetic Fields (EMF) emissions;
- Hydrographic modifications;
- Temperature increase; and
- Habitat loss and gain.

In the ES the above impacts were all found to have a negligible to minor significance[23].

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[20] Centre for Marine and Coastal Studies Ltd (CMACS Ltd) (2011) Benthic Survey Technical Report Ref: J3154 Field Report v3. February 2011.

[21] FRS (2006). Fisheries Research Services Video survey, assessment of the level of contaminants and epifauna trawls in Aberdeen Bay.

[22] OSPAR (2000). Quality Status Report 2000, Region II – Greater North Sea. OSPAR Commission, London. 136 + xiii pp.

[23] European Offshore Wind Deployment Centre Environmental Statement (2011)

2.4.2 Assessment of Potential Impacts of UXO Clearance Activities

Potential impacts on the benthic and epibenthic environment are considered to be related to physical disturbance such as crater creation arising from the UXO clearance works. Increased suspended sediments may also arise following UXO clearance, however increases from such discreet activities are likely to be far lower than those assessed during the EIA for construction activities and as such this impact is considered to be non-significant and not assessed further.

The potential impacts from UXO clearance works on the benthic environment are therefore considered to be:

- Temporary habitat disturbance.

Other impacts on the benthos assessed during the EIA are either not considered relevant during UXO clearance (e.g. EMF), or due to the studies undertaken for the EIA are considered to have no potential for significant impacts (e.g. re-suspension of contaminants).

Physical disturbance from the UXO clearance works may result in discreet, localised areas of temporary disturbance. The inshore habitat (SS.SSA.IFiSa.NcirBat) undergoes regular disturbance due to wave action and as such is not sensitive to such short term disturbance events. Recovery of this habitat would be expected in the short term due to the regular disturbance already experienced, and the fact that species in the habitat are acclimatised to such conditions[24]. The offshore habitat (SS.SSA.CMuSa.AalbNuc) is also not sensitive to disturbance events, and is predicted to recover in the shorty term due to *in-situ* repair of damaged individuals, migration of adults of mobile species, with most recolonising damaged areas first before finding new settlement areas[25].

Considering the lack of sensitivity either habitat has to temporary disturbance, and the predicted high rates of recovery following cessation of work, no significant impacts are predicted on the benthic (or epibenthic) environment following UXO clearance works.

Conclusion

The impact derived from the UXO clearance on the benthic environment was primarily considered to be related to disturbance produced by the works. The disturbance is considered to have the potential to lead to:

- Temporary habitat disturbance

[24] Tillin, H.M. 2016. Nephtys cirrosa and Bathyporeia spp. in infralittoral sand. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom.

[25] Tillin, H.M. & Budd, G., 2016. Abra alba and Nucula nitidosa in circalittoral muddy sand or slightly mixed sediment. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom.

The assessment concluded that there will be no significant impacts predicted on benthic and epibenthic receptors as a result of UXO clearance works.

2.5 Fish and Shellfish

2.5.1 Existing Environment and ES Findings

The ES for the EOWDC reports that although Aberdeen Bay is considered an important nursery ground for many species of fish and shellfish, only low levels of fishing activity are undertaken within the boundaries of the proposed EOWDC area. This is largely as a result of the poor productivity of the area[26].

The EIA found that the most common and abundant fish species were dab (*Limanda limanda*) and plaice (*Pleuronectes platessa*). These species were more abundant as juveniles in shallower inshore areas reinforcing the assumption of nursery grounds in the area. Other common fish species in the area were whiting (*Merlangius merlangus*) and hooknose (*Agonus cataphractus*), which were more abundant offshore. Commercially important species (e.g. whiting, cod (*Gadus morhua)*, and Norway pout (*Trisopterus esmarki)*), although present in the development area, were associated mainly with deeper waters[3].

No known spawning grounds are present in the development area. Spawning grounds do occur further offshore for herring (*Clupea harengus*), sandeel (*Ammodytes marinus*), and *Nephrops* (*Nephrops norvegicus*)[3].

Although some creel fishing takes place in the surrounding area, the development area is not thought to be of importance to commercially important crustacea (i.e. brown crab (*Cancer pagurus*), common lobster (*Hommarus gammarus*), or *Nephrops*)[3].

No statutory designated marine protected areas have been identified within the development area[3].

Impacts on fish from piling noise during construction/decommissioning were assessed in the Marine Ecology, Intertidal Ecology, Sediment and Water Quality ES chapter. This predicted a minor to potentially moderate significant impact. This was based on the precautionary approach adopted in the assessment of the possible effect on herring spawning grounds, given the lack of specific data on their local distribution within the area of influence of the impact.

In addition to the assessment of noise impacts on fish species, shellfish were assessed as part of the epibenthic community, and as such were assessed against the following impacts:

- The release of toxic material;
- Sediment disturbance;
- Resuspension and re-deposition;
- Underwater noise;

[26] European Offshore Wind Deployment Centre Environmental Statement (2011)

- Vibrations and Electromagnetic Field (EMF) emissions;
- Hydrographic modifications;
- Temperature increase (around the cable routes); and
- Habitat loss (either temporary and permanent) and gain (introduction of artificial habitats).

These impacts were assessed as being of negligible to minor significance, due to their general low to medium magnitude and to the high recoverability of the receptors.

2.5.2 Assessment of Potential Impacts of UXO Clearance Activities

The impact of UXO clearance on fish and shellfish receptors is primarily considered to be related to the physical injury and high noise levels produced if detonation is used as a method of UXO removal within the clearance works. Increased suspended sediments may arise following UXO clearance, however increases from such discreet activities are likely to be far lower than those assessed during the EIA for construction activities and as such this impact is considered to be non-significant and not assessed further. Contaminated sediment surveys were carried out in the EOWDC development area to inform the EIA in 2010[27]. Concentrations of the contaminants present were found to be either below detection limits (as for PAH, PCB and organotin compounds) or below international benchmarks (ISQG and PEL) and as such there were no areas of concern. It is therefore considered that there is no potential for significant impacts from re-suspension of contaminated sediments and this impact is not assessed further.

The potential impacts from UXO clearance works on marine fish and shellfish are therefore considered to be:

- Injury or mortality to any individuals within close proximity of the blast; and
- Disturbance and displacement of any individuals immediately outwith the area of injury.

The other impacts assessed as part of the ES are not considered to be relevant to UXO clearance works (e.g. EMF) and as such have not been assessed further.

Pressure waves from explosives dissipate very quickly in water, and although it is possible that some mortality or injury may occur during any detonations, the area affected is anticipated to be small. The likelihood of large numbers of fish being close to the detonation site is low and the pre detonation activity of inspections by diver and or ROV, and of attaching a charge to the UXO, is likely to cause any fish move out of the immediate area, thereby displacing them from the vicinity of the blast. As such, effects are considered to be highly localised, minimal and will not affect populations. No significant impacts are predicted to occur on fish species as a result of injury or mortality effects.

To date, no lethal effects of underwater noise have been described for crustacea (e.g. common lobster (*Hommarus Gammarus*), edible crab (*Cancer pagurus*), or Nephrops (*Nephrops*

[27] Ibid.

norvegicus))[28], and studies on lobster species have shown no adverse effects after exposure to very high sound levels (>220 dB)[29]. Shellfish do not have gas filled organs and as such can only detect noise as particle motion. As such, shellfish outwith the immediate vicinity of the blast are unlikely to suffer any adverse effects from the UXO detonation work as they are not considered sensitive to noise pressures. It is considered highly unlikely that ecologically significant numbers (i.e. such that their loss would negatively affect the local population) of shellfish will be within any radius of physical injury or mortality. Therefore no significant impacts are predicted to occur on shellfish species as a result of physical injury or noise arising from UXO clearance works.

UXO detonations will only cause discreet disturbance events and the overall clearance campaign is planned to take no longer than 20 days. Mobile species may move away from the immediate area to avoid UXO clearance works but disturbance or displacement of fish species present within the area will only occur over very short timeframes. Therefore, no significant impacts are predicted to occur on fish and shellfish species as a result of disturbance and displacement resulting from UXO clearance works.

Conclusion

The impacts predicted from the UXO clearance on fish and shellfish were primarily considered to be related to high noise levels and disturbance produced by the works. The high noise levels and disturbance are considered to have the potential to lead to:

- Injury or mortality to any individuals within close proximity of the blast; and
- Disturbance and displacement of any individuals immediately outwith the area of injury.

The assessment concluded that there will be no significant impacts on fish and shellfish as a result of UXO clearance works.

2.6 Marine Mammals

2.6.1 Existing Environment and ES Findings

The project ES[30] provides a detailed description of the baseline environment for marine mammals occurring in Aberdeen Bay.

[28] Edmonds, N.J., Firmin, C.J, Goldsmith, D., Faulkner, R.C., & Wood. D.T. 2016. A review of crustacean sensitivity to high amplitude underwater noise: Data needs for effective risk assessment in relation to UK commercial species. Marine Pollution Bulletin 108, pp 5-11

[29] Payne, J.F., Andrews, C.A., Fancey, LL., Cook, A.L,. & Christian, J.R. Pilot Study on the Effects of Seismic Air Gun Noise on Lobster (*Homarus americanus*). Canadian Technical Report of Fisheries and Aquatic Sciences No. 2712.

[30] European Offshore Wind Deployment Centre Environmental Statement (2011)

In summary, two years of monthly site-specific visual and passive acoustic boat-based surveys were conducted from 2007 to 2008 and 2010 to 2011. Four cetacean species (harbour porpoise, bottlenose dolphin, white-beaked dolphin and minke whale) were encountered and are considered to be common in Aberdeen Bay. A fifth cetacean species (Risso's dolphin) was observed during vantage point surveys. Harbour porpoise and bottlenose dolphin occur all year round while white-beaked dolphin and minke whale occur on a seasonal basis. Risso's dolphins are considered to occur on a regular/occasional basis and have been recorded off Aberdeenshire at various times of the year. With the exception of Risso's dolphin ('unknown'), the conservation status of each species is 'favourable'. Table 2-2 below summarises their densities and reference population abundances.

Table 2-2: Estimated density (SCANS II Block V; Hammond et al., 2013[31]) and abundance (Management Unit (MU); IAMMWG, 2013[32]; IAMMWG, 2015[33]) of the marine mammal species considered to occur regularly in the Aberdeen Bay area

Common name	Latin name	Density (individuals per km^2)	Abundance (MU)
Minke whale	*Balaenoptera acutorostrata*	0.028	23,528 (Celtic and Greater North Seas MU)
Bottlenose dolphin	*Tursiops truncatus*	0.001	195 (Coastal East Scotland MU)
White-beaked dolphin	*Lagenorhynchus albirostris*	0.047	15,895 (Celtic and Greater North Seas MU)
Risso's dolphin	*Grampus griseus*	No sightings therefore no density estimate	No current abundance estimate available for this species (Celtic and Greater North Seas MU)
Harbour porpoise	*Phocoena phocoena*	0.293	227,298 (North Sea MU)
Grey seal	*Halichoerus grypus*	-	6,800 (East Coast MU)
Harbour seal	*Phoca vitulina*	-	315 (East Coast MU)

Other cetacean species including white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis*) and long-finned pilot whale (*Globicephala melas*) occur off north east Scotland on an occasional basis (see Table 9 in Appendix 12.1; EOWDC, 2011[34]). Other species considered to be rare when the ES was produced may now be considered as occasional in light of more recent records e.g. humpback whale (*Megaptera novaengliae*).

In terms of seals, harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) are considered to be common in Aberdeen Bay.

Local SACs have been designated for bottlenose dolphin, grey seal and harbour seal (see Table 2-3). The possible harbour porpoise SACs which are currently undergoing consultation are outwith the local area. Even if additional SACs are proposed during the UXO clearance work, this assessment will still be appropriate because it has been undertaken by species, not using an areas-based approach.

[31] Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O. and Vázquez, J.A. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164: 107–122.

[32] IAMMWG. (2013). Management Units for marine mammals in UK waters. Cover note prepared by the UK SNCBs.

[33] IAMMWG. (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough.

[34] European Offshore Wind Deployment Centre Environmental Statement (2011)

Table 2-3: Local SACs which have marine mammals as a qualifying feature

Marine mammal qualifying feature	SAC	Approximate distance from the UXO clearance area (km)
Bottlenose dolphin	Moray Firth	147
Grey seal	Isle of May	122
	Berwickshire and North Northumberland Coast	142
	Faray and Holm of Faray	242
Harbour seal	Firth of Tay and Eden Estuary	103
	Dornoch Firth and Morrich More	203

Potential impacts on marine mammals from UXO clearance work were not assessed as part of the project ES.

2.6.2 Assessment of Potential Impacts of UXO Clearance Activities

The potential routes to impact for marine mammals from the proposed UXO clearance work are considered to be:

- Increased anthropogenic noise from the UXO clearance work;
- Increased anthropogenic noise from the ROV's geophysical survey systems;
- Increased vessel noise;
- Collision with vessels; and
- Indirect effects.

A worst case scenario (up to 20 UXO which need to be cleared) was assessed in the risk assessment that accompanies the EPS Licence application).

The findings of the EPS Risk Assessment (see Appendix A) have been summarised in Table 2-4 below. While the EPS risk assessment covered cetaceans (whales, dolphins and porpoises), the findings are also considered to apply to both harbour and grey seals (pinnipeds). Through implementation of a comprehensive marine mammal mitigation plan (see Section 7 of EPS Risk Assessment), the significance of the only potential impact whose residual impact is greater than none or negligible is considered to be minor (high frequency cetaceans, in this case harbour porpoise, which are between 1.793 km and 2 km from the detonation site when UXO are detonated may be susceptible to the onset of PTS). There is no potential for low or mid frequency cetaceans or seals to be susceptible to PTS onset because their cumulative SELs for PTS onset are smaller than the 1 km marine mammal mitigation zone (see Table 2-5).

Table 2-4: Summary of the findings of the EPS Risk Assessment

Potential route to impact	Potential impact	Residual impact (post-mitigation)	Significance
Increased anthropogenic noise from the UXO clearance work	Lethal effects and physical injury (within 100 m of the detonation site)	None	-
	Auditory injury (within 2 km of the detonation site)	Auditory injury (to high frequency cetaceans between 1.793 km and 2 km from the detonation site only)	Minor
	Disturbance	None	-
Increased anthropogenic noise from the ROV's geophysical survey systems	Lethal effects and physical injury	None	-
	Auditory injury	Negligible	Negligible
	Behavioural response	None	-
Increased vessel noise	Avoidance	Negligible	Negligible
Collision with vessels	Lethal effects and physical injury	Negligible	Negligible
Indirect effects (due to sediment disturbance, localised increases in suspended sediment concentrations, release of sediment contaminants, changes in prey resources)	Altered foraging behaviour/success	Negligible	Negligible

Assessment of potential SAC connectivity – marine mammals

There is potential for animals belonging to the populations which use the SACs listed in Table 2-3 above to be present in the Aberdeen Bay area when the UXO clearance work is being undertaken. As a result of implementation of AOWFL's comprehensive marine mammal mitigation plan (pre-detonation searches, use of an ADD and 'soft start charges'; see section 7 of EPS Risk Assessment), however, animals belonging to the populations which use the SACs listed above will not be susceptible to the onset of PTS. This is because the estimated PTS onset ranges for all three species (see Table 2-5 below) are smaller than the marine mammal mitigation zone (which extends to 1 km from the detonation site). Therefore no significant effects on SAC marine mammal species are predicted.

Table 2-5: Estimated PTS onset ranges (km) from cumulative SELs (using the more conservative NOAA (2016) threshold of 185 dB re 1 µPa²s)[35]

Charge size (kg)	Low frequency cetaceans	Mid frequency cetaceans (bottlenose dolphin)	High frequency cetaceans	Pinnipeds in water (grey seal and harbour seal)
Soft start (0.05 + 0.1 + 0.15) + 50	1	0.125	2	0.350

Conclusions

The potential impact of the UXO clearance work at EOWDC on marine mammals was primarily considered to be related to increased noise levels. The increased noise levels were considered to have the potential to lead to:

- Lethal effects and physical injury (to marine mammals within 100 m of the detonation site);
- Auditory injury (to marine mammals up to 2 km from the detonation site); and
- Disturbance.

The assessment concluded that, post-mitigation (pre-detonation searches, use of an ADD and 'soft start charges'), the potential for lethal effects and physical injury and disturbance are nil. There is potential for harbour porpoises between 1.793 km and 2 km from the detonation site when UXO are detonated to be susceptible to the onset of PTS. However, the significance of this potential residual impact is considered to be minor. There is no potential for low or mid frequency cetaceans or seals to be susceptible to PTS onset because their cumulative SELs for PTS onset (Table 2-5) are smaller than the 1 km marine mammal mitigation zone.

No significant impacts are predicted for SAC marine mammal species (bottlenose dolphin, grey seal, harbour seal) as a result of the UXO clearance work.

2.7 Commercial Fisheries

2.7.1 Existing Environment and ES Findings

Assessments of commercial fisheries and shellfish were carried out between 2007 - 2011 for the EIA for the consented wind farm. The Environmental Statement for the EOWDC[36] describes fishing activity within the area of EOWDC as low, largely as a result of the poor productivity in the area. Through consultation it was identified that the area of the EOWDC constitutes only a small proportion of the fishing grounds used by the four commercial ves-

[35] This distances have been taken from Appendix B of BOWL (2016). UXO Clearance Marine Licence – Environmental Report. Downloaded from http://www.gov.scot/Topics/marine/Licensing/marine/scoping/Beatrice/uos.

[36] European Offshore Wind Deployment Centre Environmental Statement (2011)

sels identified as operating within the general area. It was concluded that given the low levels of fishing activity in the area and the small area of the EOWDC site, the potential impacts on fishing from the wind farm are of negligible significance.

2.7.2 Assessment of Potential Impacts of UXO Clearance Activities

Pressure waves from explosives dissipate very quickly in water, and although it is possible that some mortality or injury may occur to target commercial fish during detonations, the area affected is predicted to be highly localised. As previously mentioned in Section 2.5 of this document, if any target fish or shellfish are affected, it is considered highly unlikely that ecologically significant numbers (i.e. such that their loss would negatively affect the local population) would be within any radius of the detonation to induce physical injury or mortality. The pre detonation activity of inspections by diver/ROV, and of attaching a charge to the UXO, is likely to cause any target fish to move out of the immediate area, thereby displacing them from the vicinity of the blast. As such, effects are considered to be highly localised, minimal and will not affect commercial catches or any shipping vessels (shipping has been covered in Section 2.8). Therefore, the effects of the UXO clearance activities are not considered to be significant on commercial fishing activities.

2.8 Shipping and Navigation

2.8.1 Existing Environment and ES Findings

The Environmental Statement for the EOWDC[37] describes the existing location for the EOWDC is such that it does not affect the main navigation routes in the area, including the bulk of shipping heading to/from Aberdeen Harbour. The location of this site is considered acceptable in terms of navigational safety and there is limited fishing and recreational vessel activity in the area. This outcome was found to be the same for all phases of development; construction, operation and decommissioning.

2.8.2 Assessment of Potential Impacts of UXO Clearance Activities

For UXO clearance activities, the potential for disturbance to shipping resulting from interference, restriction and displacement is envisaged to be very limited. The embedded mitigation within the proposed clearance works identifies the following:

- Prior to detonations occurring, the appropriate consultations with MS-LOT, HM Coastguard and other relevant stakeholders will occur;
- VHF radio broadcasts and Notice to Mariners will be broadcast to ensure that mariners are aware of the location, time and nature of the works prior to works commencing;
- Maintenance of a safety exclusion zone of 1.5 km by use of a guard vessel to close access to the detonation location to all normal marine traffic whilst detonation occurs.

[37] Ibid

Given the above mitigation measures and the limited shipping within the area, and due to the localised nature of the detonations and low number and short term duration with which the detonation occurs, any potential effects resulting from UXO clearance are not considered to be significant.

2.9 Marine Archaeology

2.9.1 Existing Environment and ES Findings

A total of two sites designated as of anthropogenic origin and of archaeological interest (WA 7071 and WA 7072) were identified during the assessment of geophysical survey data reported within the Environmental Statement for the EOWDC[38]. Of these, one is a previously uncharted wreck site (WA 7071) and the other is possibly a large piece of debris relating to a wreck (WA 7072) and both heritage assets are located in close proximity to Turbine AWF07 (see Figure 1 below). The ES states that avoidance is the preferred mitigation strategy where practicable, however, if there is potential for encountering cultural heritage assets, the ES proposes a precautionary mitigation strategy of 50 m archaeological exclusion zones (buffered around the visible extents of each asset) as well as application of Crown Estate[39] guidance during works.

2.9.2 Assessment of Potential Impacts of UXO Clearance Activities

UXO clearance activities have the potential to affect marine archaeology through direct and indirect impacts to the seabed. It is also possible that finds of archaeologist interest may be identified as a result of UXO investigation activities.

It is envisaged that during site mobilisation, the Vessel Master and Contractor will be briefed on the exact locations of Archaeological Exclusion Zones (AEZ) and a chart of these locations provided to the Vessel Master and Contractor to ensure limited interference with AEZs during the described pre-works where practicable. In addition, The Crown Estate Protocol for Archaeological Discoveries: Offshore Renewables Projects (2014) will be applied during the UXO clearance works and works will avoid AEZs unless absolutely necessary and otherwise agreed with MS-LOT in consultation with Historic Environment Scotland.

Seabed disturbance may cause secondary physical effects to marine archaeology assets through settlement of sediment out of the water column, however the increases in sediment from the detonation activities are anticipated to be short term and localised with the associated sediment deposition also localised and discrete.

During the works, any object that is identified as potential archaeology will be reported to the Project Archaeologist (or Marine Scotland Licencing if the Project Archaeologist is yet to be appointed). AOWFL has already stated in the ES for the project a commitment to producing an Environmental Management Plan which includes an Archaeological Plan that will outline

[38] European Offshore Wind Deployment Centre Environmental Statement (2011)

[39] Crown Estate Protocol for Archaeological Discoveries: Offshore Renewables Projects (2014)

mitigation measures such as avoidance and reporting protocols. In brief, upon a discovery, a protocol reporting form will be completed by the Client Representative on board the vessel and if possible, photographs of the object will be issued to the Project Archaeologist, together with the coordinates of where the suspect archaeology is located to in order for the target not to be affected by the clearance works. If a stray archaeological target is deemed to be of potential high importance (from the real-time ROV check), then the archaeologist will be consulted and advice sought before permission is given to relocate the target.

As is standard for Marine Licences, it is suggested that the following condition is placed on any grant of consent

The licence holder must provide a report of the operation through the Protocol for Archaeological Discoveries (published by the Crown Estate), should the UXO or any other item found during the works merit inclusion as an item of historic interest. Details of the report must be provided to Marine Scotland within 3 months of submission.

Reason: To ensure the integrity of archaeologically important items is not compromised.

Due to the planned avoidance of AEZs, implementation of the embedded mitigation measures for archaeology, and the short term and localised nature of increased sediment, the effects of UXO clearance activities on marine archaeology is considered to be not significant.

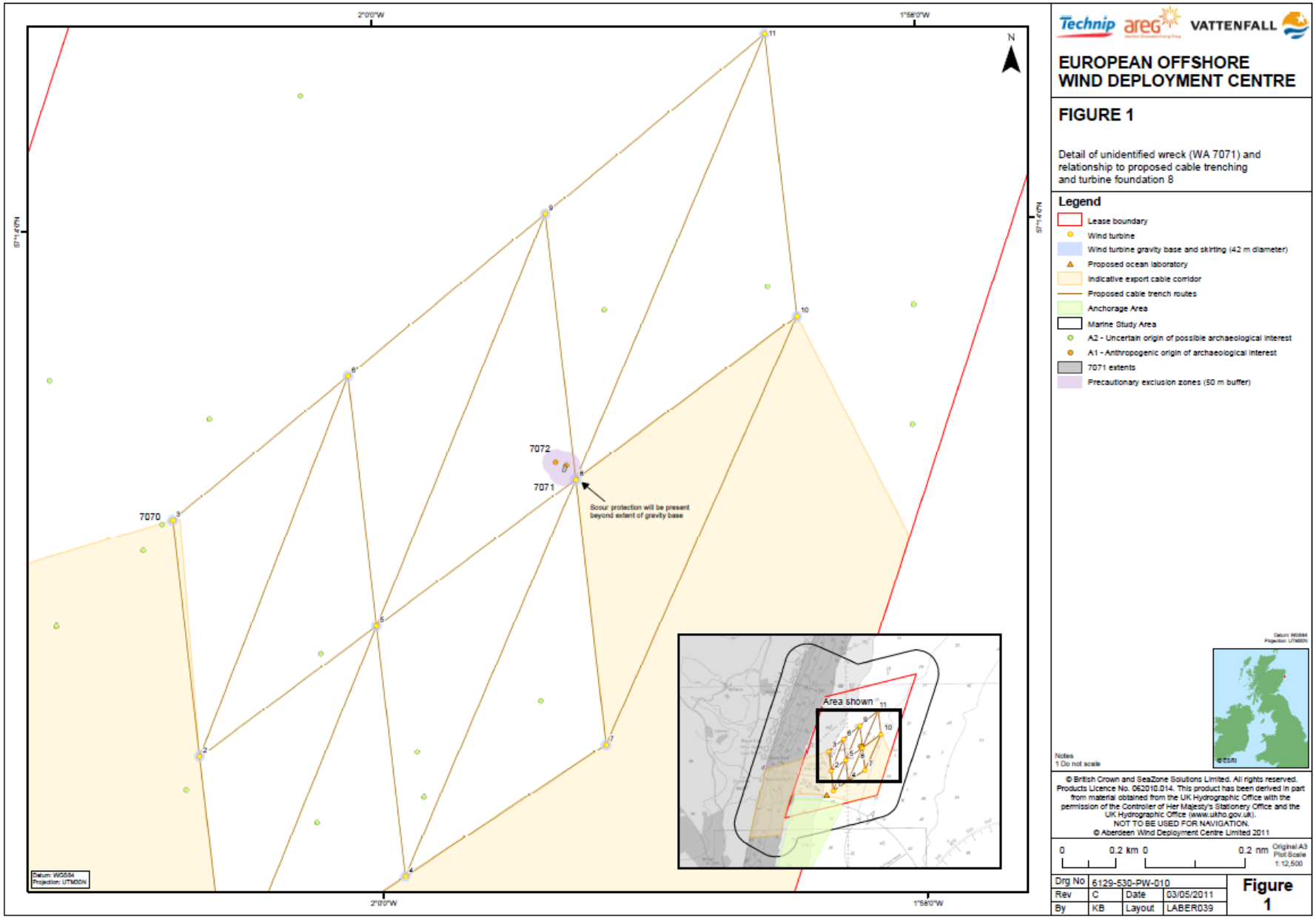


Figure 1 – Locations of WA7071 and WA7072 (taken from Appendix 18.2, Figure 1 from Environmental Statement)

2.10 Infrastructure and Other Users

The Environmental Statement for the EOWDC[40] describes other marine users as:

- Oil and gas industry
- Pipelines, cables and telecommunications
- Other wind power resources
- Dredging and disposal sites
- Ministry of Defence firing range
- Drums Link firing range
- Recreational sailing
- Surfing
- Kite surfing; and
- Canoeing and sea kayaking

There are currently no oil and gas fields within the location of EOWDC and due to this location and the mitigation measures proposed to mitigate impacts on shipping and navigation (see 2.8), it is anticipated that any potential impacts on the oil and gas industry will be not significant.

There are two abandoned telecommunications cables within the vicinity of the EOWDC. However, there are no other cables or pipelines within development area. It is possible, depending upon the location of the identified UXO, that potential impacts might occur to the integrity of the abandoned telecommunication cables. As such, the mitigation measures would propose to relocate the UXO hazard from the location and detonate it at another location. Thus, impacts on pipelines and cables are anticipated to be not significant.

UXO clearance activities will not have any significant impact on dredging or disposal activities as there are no disposal and dumping grounds located within the area of the EOWDC. Due to this and the mitigation measures proposed to mitigate impacts on shipping and navigation (see Section 2.8), it is anticipated that any potential impacts on the dredging and disposal activities industry will be not significant.

The recreational receptors listed above may also be affected by UXO clearance activities, although the ES has already stated the lack of recreational sailing within the area. The embedded mitigation measures of Notices to Mariners combined with radio navigation broadcasts will ensure that recreational receptors are aware of the location and nature of the works, and the implementation of a 1.5 km safety exclusion zone, combined with a guard vessel, is designed to ensure the safety of other marine users.

The UXO clearance activities will be temporary and of short duration. Due the implementation of the above embedded mitigation measures, the effects of UXO clearance activities on other marine users is considered to be not significant.

[40] European Offshore Wind Deployment Centre Environmental Statement (2011)

3 SUMMARY

EOWDC and its contractors are currently undertaking geophysical surveys in order to investigate anomalies within the UXO Clearance Area. UXO survey data will be processed and quality assured resulting in identification of a number of targets which model as potential UXO. ROV inspections will then take place on those targets for which the avoidance strategy is impractical in order to discount those which can be identified as non-UXO.

Any potential UXO identified will then be targeted for a detailed survey by ROV to confirm whether or not any objects are UXO hazards and therefore represent a risk to construction activities. If identified as a UXO hazard, AOWFL will seek to, firstly, avoid the UXO by micrositing around it, or, secondly, move the UXO. Detonation by controlled explosion to remove the UXO hazard will be used as a last resort should avoidance or removal not be possible. Through this process any risk to subsequent construction activities will be removed. The exact number, type and location of those remaining potential or confirmed UXO items which require clearance will then be confirmed with MS-LOT to confirm that the number lie within the worst case scenario assessed.

This supporting information has been prepared in support of the Marine Licence application for the UXO clearance activities and has provided an assessment of the potential environmental impacts of the licensable activities. A summary of the environmental effects is presented in Table 3-1 below. This table reveals that due to the localised nature of detonations, low number and short duration of any detonation works, all of the receptors assessed for potential impacts would not be significantly affected by the UXO clearance activities.

The assessment of potential impact upon marine mammals provided within this assessment draws heavily upon the European Protected Species (EPS) Risk Assessment (also presented in Appendix A), marine mammal mitigation plan and EPS derogation licence that have been submitted in tandem with the Marine Licence Application.

Table 3-1: Summary of potential environmental impacts

Receptor	Potential Impact	Significant/Not significant (after mitigation)
Physical Processes	UXO clearance activities may lead to physical disturbance and increases in suspended sediment concentrations (SSC) and deposition on the seabed.	Not Significant
Migratory Fish	UXO clearance activities may lead to injury or mortality to any individuals within close proximity of the blast.	Not Significant
	UXO clearance activities may lead to disturbance and displacement of any individuals immediately outwith the area of injury.	Not Significant

Receptor	Potential Impact	Significant/Not significant (after mitigation)
Benthic Ecology	UXO clearance activities may lead to temporary habitat disturbance.	Not Significant
Fish and Shellfish	UXO clearance activities may lead to injury or mortality to any individuals within close proximity of the blast.	Not Significant
	UXO clearance activities may lead to disturbance and displacement of any individuals immediately outwith the area of injury.	Not Significant
Marine Mammals	UXO clearance may lead to lethal effects and physical injury (to marine mammals within 100 m of the detonation site).	Not Significant
	UXO clearance may lead to auditory injury (to harbour porpoise between 1.793 and 2 km of the detonation site).	Not Significant
	UXO clearance may lead to disturbance.	Not Significant
	UXO clearance may lead to behavioural response.	Not Significant
	UXO clearance may lead to avoidance.	Not Significant
	UXO clearance may lead to altered foraging behaviour/success.	Not Significant
Commercial Fisheries	UXO clearance activities may lead to interference, restriction and displacement of fishing activity	Not Significant
Shipping and Navigation	UXO clearance activities may result in interference to shipping and navigation.	Not Significant
Marine Archaeology	UXO clearance activities may affect marine archaeology through direct disturbance and secondary effects.	Not Significant
Infrastructure and Other Users	UXO clearance activities may affect the activities of other oil and gas, infrastructure and recreational receptors in the vicinity.	Not Significant

APPENDIX A – EPS RISK ASSESSMENT

Please see accompanying document ‘Appendix A – EOWDC EPS Risk Assessment – UXO Clearance’.

European Offshore Wind Deployment Centre

EPS Risk Assessment:

UXO Clearance

ABE-CM-DB-0008

24/03/2017

Prepared by:	Kate Grellier	Senior Environmental Consultant – Marine Mammals (Natural Power)		20/03/2017
	NAME	ROLE		DATE
Reviewed by:	Nancy McLean	Principal Environmental Consultant (Natural Power)		21/03/2017
	NAME	ROLE		DATE
Approved	28.03.2017	00	Adam Ezzamel	[redacted]
STATUS	**DATE**	**REVISION**	**NAME**	**SIGNATURE**

Revision	Date	Revision changes
A	13/03/2017	Draft issue
B	22/03/2017	Final issue

TABLE OF CONTENTS

LIST OF ABBREVIATIONS AND DEFINITIONS

Term	Definition / Description
ADD	Acoustic Deterrent Device
AOWF	Aberdeen Offshore Wind Farm
AOWFL	Aberdeen Offshore Wind Farm Limited
BOWL	Beatrice Offshore Windfarm Ltd.
DECC	Department for Energy and Climate Change
EMLB	Enclosed Mine Lifting Bag
EOD	Explosive Ordnance Disposal
EOWDC	European Offshore Wind Deployment Centre
EPS	European Protected Species
ES	Environmental Statement
FCS	Favourable Conservation Status
IROPI	Imperative Reasons of Overriding Public Interest
MS LOT	Marine Scotland Licensing Operations Team
NEQ	Net Explosive Quantity
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PTS	Permanent Threshold Shift
ROV	Remotely Operated underwater Vehicle
SEL	Sound Exposure Level
SPL	Sound Pressure Level
TTS	Temporary Threshold Shift
UXO	Unexploded Ordnance

SUMMARY

The European Offshore Wind Deployment Centre (EOWDC) also known as Aberdeen Offshore Wind Farm (AOWF) received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 26 March 2013 (the S36 Consent) and was granted a Marine Licence from the Scottish Ministers on 15 August 2014 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

The objective of this report is to assess the potential impact of unexploded ordnance (UXO) clearance work on European Protected Species (EPS) in Aberdeen Bay in order to determine the need for an EPS licence under Annex IV of the Habitats Directive (Council Directive 92/43/EEC).

This assessment (of increased anthropogenic noise from the UXO clearance work, increased anthropogenic noise from use of the ROV's geophysical survey systems, increased vessel noise, collision with vessels and indirect effects) from a worst case scenario concluded that, post-mitigation (pre-detonation searches, use of an ADD and 'soft start' charges):

- There was no/negligible potential for lethal effects, physical injury and disturbance to marine EPS; and
- The potential for auditory injury (due to increased anthropogenic noise from the UXO clearance work) is considered to be minor.

Following the 2014 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2014) entitled "The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters", there is potential for (auditory) injury to marine EPS, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from increased anthropogenic noise from the UXO clearance work.

Therefore an EPS licence will be required for this potential impact (increased anthropogenic noise from the UXO clearance work).

It is considered that a licence can be granted because the three tests relating to the requirements of Regulation 44 of the Habitats Regulations which must be passed before a licence can be granted (detailed in section 3) have been satisfied (see section 6).

1 INTRODUCTION

1.1 Background

The European Offshore Wind Deployment Centre (EOWDC) also known as Aberdeen Offshore Wind Farm (AOWF) received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 26 March 2013 (the S36 Consent) and was granted a Marine Licence from the Scottish Ministers on 15 August 2014 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

Aberdeen Offshore Wind Farm Limited (AOWFL) is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain, and decommission the Aberdeen Offshore Wind Farm.

1.2 Objectives of this Document

The objective of this report is to assess the potential impact of unexploded ordnance (UXO) clearance work on European Protected Species (EPS) in Aberdeen Bay in order to determine the need for an EPS licence under Annex IV of the Habitats Directive (Council Directive 92/43/EEC).

Natural Power Consultants Ltd (Natural Power) has compiled this report on behalf of AOWFL who will be undertaking/commissioning the UXO clearance work.

2 PLANNED WORK

2.1 Background

The likelihood of encountering different types of UXO within the EOWDC site was assessed most recently in 2016 (ORDTEK, 2016). This assessment took into account the likely presence of each type of UXO within the EOWDC site and the likelihood of encounter given environmental conditions (movement due to tidal currents, coverage by sediment, exposure by scour etc.) and impact penetration (potentially leading to UXO being buried within the sediment i.e. below encounter depth).

The report concludes that the likely UXO to be encountered will be:

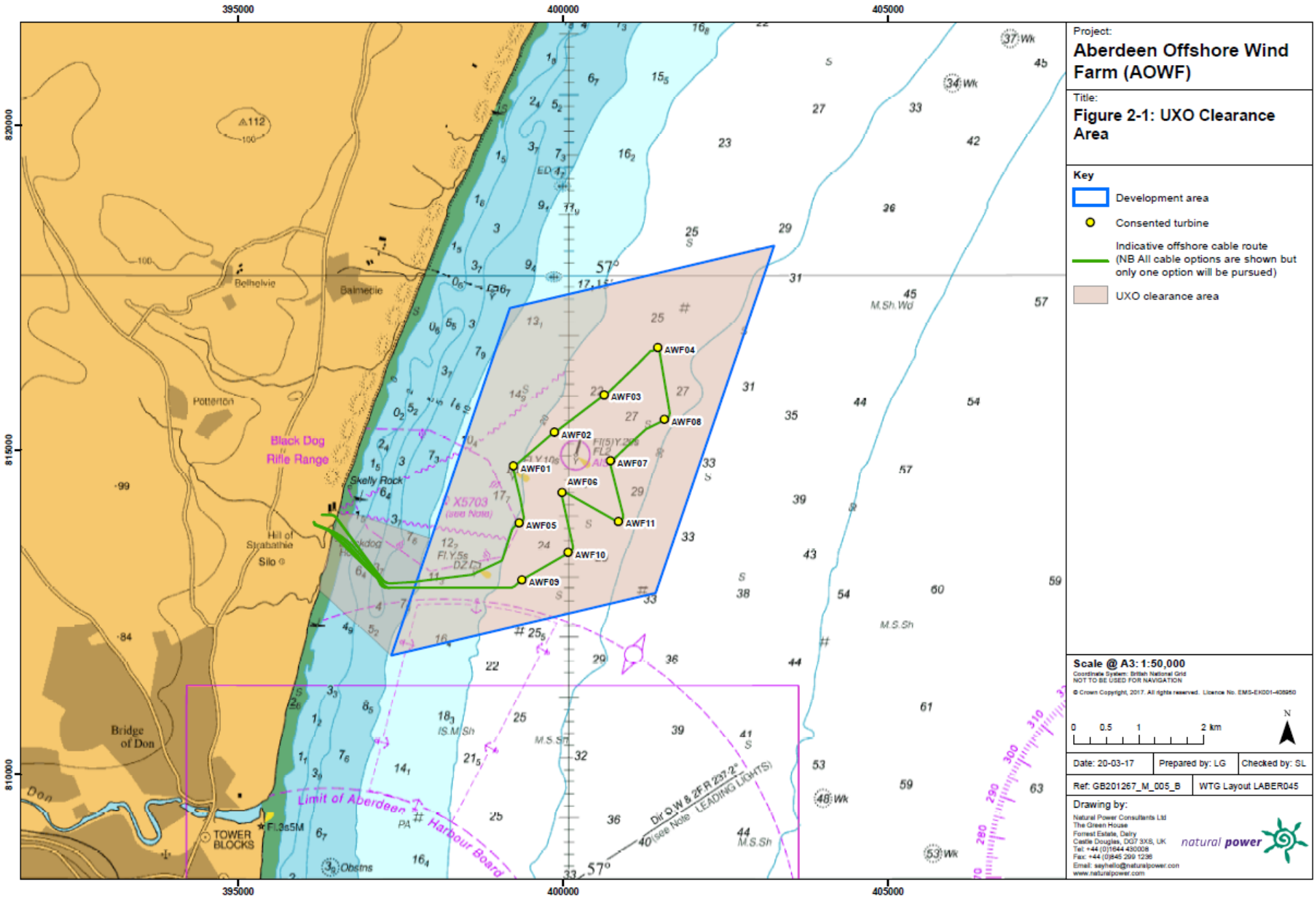
- German World War I buoyant mines: It is likely that less than 50 were laid across the site during the conflict, and some could have broken loose from moorings and remain on the sea bed. They would have a charge weight of 130 kg of either wet gun cotton or TNT;
- Projectiles: These could have originated from the Blackdog Links Ranges, which have been operational since at least 1940, and which partially overlap the site boundary. There were also at least five Heavy Anti-Aircraft gun and rocket batteries within range of the site, whose operation may have contaminated the site with projectiles; and
- German and Allied HE bombs: During World War II, German aircraft frequently attacked ships approaching and leaving Aberdeen. Some bombs intended for Aberdeen City fell into the sea or were jettisoned deliberately.

Given the risks identified, the following most likely and worst case scenarios have been identified:

- Most likely scenario: Up to five UXO that need to be cleared/detonated. These could be German World War I buoyant mines and High Explosive bombs arising from World War II. Ordtek has classified these as 'very likely' or 'likely' to be encountered and to have between 50-500 kg Net Explosive Quantity (NEQ), although 50 -70 kg bombs are likely to predominate. Projectiles likely to be encountered in the site are to be relatively small calibre shells of 2-5 kg NEQ.
- Worst case scenario: The identification of up to 20 UXO that need to be cleared/detonated. These could be British World War II buoyant mine, parachute mines, German World War I buoyant mines and High Explosive bombs or projectiles arising from World War II. Estimated worst case is that the largest amount of NEQ to be detonated is approximately 700 kg (German GC mines) however, the Ordtek report classifies the likelihood of encountering this type of UXO as 'very unlikely'.

A pre-clearance geophysical and UXO survey[1] to detect and identify targets and therefore inform any UXO clearance work required (see Figure 2-1) is ongoing and the works are anticipated to be completed by the end of April.

[1] EPS licence number MS EPS 09/2016/02


395000
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AWF02
AWF03
AWF04
AWF05
AWF06
AWF07
AWF08
AWF09
AWF10
AWF11
Black Dog Rifle Range
Skelly Rock
Limit of Aberdeen Harbour Board
TOWER BLOCKS
Bridge of Don
Potterton
Belhelvie
Balmedie
Hill of Strabathie Silo
Project:
Aberdeen Offshore Wind Farm (AOWF)
Title:
Figure 2-1: UXO Clearance Area
Key
Development area
Consented turbine
Indicative offshore cable route (NB All cable options are shown but only one option will be pursued)
UXO clearance area
Scale @ A3: 1:50,000
Coordinate System: British National Grid
NOT TO BE USED FOR NAVIGATION
0 0.5 1 2 km
N
Date: 20-03-17
Prepared by: LG
Checked by: SL
Ref: GB201267_M_005_B
WTG Layout LABER045
Drawing by:
Natural Power Consultants Ltd
The Green House
Forrest Estate, Dalry
Castle Douglas, DG7 3XS, UK
Tel: +44 (0)1644 430008
Fax: +44 (0)845 299 1236
Email: seyhello@naturalpower.com
www.naturalpower.com
natural power

2.2 Methodology

AOWFL has adopted the proactive UXO risk mitigation strategy on EOWDC in accordance to CIRIA C754 guidance (CIRIA, 2015). The risk measures include:

1. Geophysical and UXO survey (ongoing; anticipated to be completed by the end of April) – the survey employs state of the art survey equipment to scan the seabed using acoustic techniques (SSS, MBES) and also record relative changes of the magnetic field using magnetometry to identify surface and shallow buried anomalies.
2. Geophysical anomaly grading and selection – once the geophysical survey data are collected, the data are processed and any anomalies identified are graded based on a number of factors, e.g. magnetic signature. This helps identify if any of the anomalies could be interpreted as possible UXO. Note, it does not identify items that are definitively UXO, but rather identifies items that, while they cannot be discounted as potentially being UXO, may in fact be other items, such as seabed debris.
3. Avoidance – in the first instance, anomalies that are interpreted as possible UXO are to be avoided by positioning infrastructure or moving construction activities clear of the anomaly at a specified safe distance.
4. UXO investigation and verification – if any anomalies interpreted as possible UXO cannot be avoided, then they need further investigation to verify whether they are UXO. Subject to the nature and location of the anomaly as well as environmental and safety constraints and limitations, investigations may be undertaken by divers or ROV. Both ROVs and divers are usually equipped with some form of corroborative survey equipment or in the case of ROVs SSS and/or gradiometers and a dredge with capacity to uncover buried targets. Once investigated, the targets can be verified as either UXO or non-UXO by a UXO specialist.
5. Disposal – items that are confirmed as UXO through invesitgation and verification may need to be rendered safe.

In the first instance, AOWFL will seek to avoid the UXO (by re-routing cables or micro-siting wind farm infrastructure).

If avoidance is not possible then AOWFL will physically remove the UXO from the area of concern (see 2.2.1 for methods). Relocation will be dealt with on a case by case basis. UXO may be moved just outside the influence zone, i.e. to a location where it would be safe to operate the vessel(s), to an alternative area within the wind farm/site boundary (see Figure 2-1), or recovered onto the vessel and brought ashore for execution in a destruction facility on land. The co-ordinates of any relocated items will be logged.

Detonation by controlled explosion (see 2.2.2 for methods) will be used as a last resort should neither avoidance nor removal be possible. UXO may either be detonated (using donor charges) *in situ*, or relocated and disposed of together with other confirmed UXO also relocated to the same location (N.B. only small UXO will be disposed of in this manner). Once all relocated items have been placed, and before detonation is undertaken, a survey of the location will be conducted to confirm there are no other objects or anomalies which may also be unidentified UXO.

2.2.1 UXO relocation with ROV or divers

In the event that a UXO needs to be relocated (i.e. because it cannot be avoided), a remote Enclosed Mine Lifting Bag (EMLB; deployed either by an ROV or a diver) will be used to bring the UXO near the surface and allow it to be towed. Throughout the tow the UXO will be suspended below the EMLB to minimise fragmentation hazard in the unlikely event of uncontrolled initiation.

2.2.2 Neutralisation

Neutralisation is where the UXO is destroyed by deployment of a countermining donor charge of between 2-10 kg (although 5 kg is envisaged to be the standard size donor charge to be used). One of three methods of placing and firing the charge will be used:

- Acoustic – where the charge is delivered by an ROV and initiated using an acoustic trigger system;
- Shock tube – where the charge is delivered by an ROV and initiated using a non-electric triggering system; or
- Detonation cord – where the charge is delivered by a diver and initiated using a surface controlled fuse.

Each of the three neutralisation methods is similar in that they all require a donor charge to be placed on/next to the UXO. The overall impact on cetacean EPS will be the same irrespective of which method is used.

Detonations will only take place during daylight hours, in good visibility and in good sea conditions (ideally in sea states of less than or equal to 3) to provide good conditions for the pre- and post-detonation searches. Each detonation will take approximately 6-8 hours to complete from when the vessels first arrive to set up the detonation to when the removal of debris is complete and the area is declared safe.

Two vessels will be involved in the UXO clearance (and marine mammal mitigation) work:

- An ‘ROV/dive support vessel’ from which any charges will be set (and on which the MMOs/PAM operators will be based). Once the charges are set (and the pre-detonation search (see section 7.1) completed), the support vessel will retreat to a distance of 1,500 m from the detonation site and maintain a navigational safety zone to prevent other vessels from approaching the detonation site; and
- A ‘guard vessel’ which will undertake preparation and implementation of the detonations (and from which the Acoustic Deterrent Device (ADD) will be deployed). She will then maintain a detonation safety zone of 500 m to prevent other vessels (including those involved in the UXO clearance work) from approaching the detonation site.

2.3 Timing and Duration

The UXO investigation and clearance work is likely to commence in May 2017. The anomaly investigation stage may last between one and six months depending on the findings of the UXO and geophysical survey. The duration of the UXO clearance work is likely to be 20 days (potentially non-consecutive) given suitable weather conditions. In addition, works to clear potential rogue UXO during construction could take place between Q3 2017 and Q3 2018. In advance of each disposal activity, plans and timings will be shared with the Marine Scotland and through Notice To Mariners.

More information on the likely timing and duration of the UXO clearance work will be available after the pre-clearance geophysical UXO survey data has been processed.

3 LEGAL REQUIREMENT

All species of cetacean in waters around the UK are considered EPS under Annex IV of the Habitats Directive (Council Directive 92/43/EEC) which covers animal and plant species of community interest in need of strict protection.

The need to consider EPS in waters off Scotland comes from two articles of legislation. The first is the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) which transposes the Conservation of Natural Habitats and Wild Fauna and Flora Directive (Council Directive 92/43/EEC; referred to as the Habitats Directive) into Scottish law. This legislation covers Scottish Territorial Waters. The second is the Offshore Marine Conservation (Natural Habitats, &c) Regulations 2007 (as amended), which transposes the Habitat Directive in UK waters beyond 12 nautical miles offshore. However because there is no potential to impact cetaceans in offshore waters, the Offshore Marine Regulations do not apply in this instance.

The Conservation of Habitats and Species Regulations 1994 (as amended in Scotland) state, under section 39, that it is an offence to:

- Deliberately or recklessly capture, kill or injure a wild animal of an EPS, as listed under Annex IV of the Habitats Directive;
- Damage or recklessly destroy, or cause deterioration of the breeding sites or resting places of an EPS;
- Deliberately or recklessly disturb EPS (in particular disturbance which is likely to impair their ability to survive, breed, reproduce, nurture their young, migrate or hibernate);
- Deliberately or recklessly disturb an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; and
- Deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

It is therefore an offence to deliberately or recklessly disturb a single cetacean in Scottish Territorial Waters.

In addition, any means of capturing or killing which is indiscriminate and capable of causing the local disappearance of – or serious disturbance to – any population of EPS is an offence.

Licences may be granted by the Secretary of State which would allow otherwise illegal activities to go ahead.

Three tests must be passed before a licence can be granted:

- The licence must relate to one of the purposes referred to in Regulation 44;
- There must be no satisfactory alternative (Regulation 44, 3a); and
- The action authorised must not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status (FCS) in their natural range (Regulation 44, 3b).

FCS is defined in the Habitats Directive as the following:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable element of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

3.1 Guidance

In March 2014 Marine Scotland and Scottish Natural Heritage (SNH) produced a guidance document (entitled 'The protection of Marine European Protected Species from injury and disturbance' (Marine Scotland and SNH, 2014)) relating to Regulation 39 (2) in the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland). Marine Scotland recognises that this guidance, which relates to Scottish Territorial Waters, represents a very precautionary approach to the interpretation of the Habitats Directive with regards to EPS '…This guidance reflects a precautionary approach…', and requires careful examination of the potential impacts of proposed offshore activities, and the resultant noise produced, on individual animals likely to be present at the location.

The guidance states that the two main potential causes of death or injury are physical contact (with a vessel) and anthropogenic noise.

Likelihood of disturbance for individuals includes factors such as:

- Spatial and temporal distribution of the animal in relation to the activity;
- Any behaviour learned from prior experience with the activity;
- Similarity of the activity to biologically important signals (particularly important in relation to activities creating sound); and
- The motivation of the animal to remain within the areas (e.g. food availability).

Assessment of likelihood of potential impacts should include the following considerations:

- Type of activity;
- Duration and frequency of the activity;
- Extent of the activity;
- Timing and location of the activity; and
- Other known activities in the area at the same time.

4 EPS IN ABERDEEN BAY

A detailed description of the baseline environment for marine mammals occurring in Aberdeen Bay is available from Appendix 12.1: Marine Mammals Baseline of the project Environmental Statement (ES) (EOWDC, 2011).

In summary, two years of monthly site-specific visual and passive acoustic boat-based surveys were conducted from 2007 to 2008 and 2010 to 2011. Four EPS (harbour porpoise, bottlenose dolphin, white-beaked dolphin and minke whale) were encountered and are considered to be common in Aberdeen Bay. A fifth species (Risso's dolphin) was observed during vantage point surveys. Harbour porpoise and bottlenose dolphin occur all year round while white-beaked dolphin and minke whale occur on a seasonal basis. Risso's dolphins are considered to occur on a regular/occasional basis and have been recorded off Aberdeenshire at various times of the year. With the exception of Risso's dolphin ('unknown'), the conservation status of each species is 'favourable'. Table 4-1 below summarises their densities and reference population abundances.

Other EPS including white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis*) and long-finned pilot whale (*Globicephala melas*) occur off north east Scotland on an occasional basis (see Table 9 in Appendix 12.1 of the AOWFL ES). Other species considered to be rare when the ES was produced may now be considered as occasional in light of more recent records e.g. humpback whale (*Megaptera novaengliae*).

A local Special Area of Conservation (SAC) has been designated for bottlenose dolphin (Moray Firth SAC). The possible harbour porpoise SACs which are currently undergoing consultation are outwith the local area. Even if additional SACs are proposed during the UXO clearance work, the risk assessments undertaken (see Section 5) will still be appropriate. This is because they have been undertaken on an EPS basis, not using an area-based approach.

Whilst not considered specifically in this assessment due to their low likelihood of occurrence, any assessment of, or mitigation measures put in place for, the species assessed are considered to be appropriate/relevant for other less commonly occurring species of cetacean in Aberdeen Bay. Such mitigation measures are also relevant for non-EPS such as seals (harbour seal, *Phoca vitulina*, and grey seal, *Halichoerus grypus*, are considered to be common in Aberdeen Bay).

Table 4-1: Estimated density (SCANS II Block V; Hammond et al., 2013) and abundance (Management Unit (MU); IAMMWG, 2015) of the EPS considered to occur regularly in the Aberdeen Bay area

Common name	Latin name	Density (individuals per km^2)	Abundance (MU)
Minke whale	*Balaenoptera acutorostrata*	0.028	23,528 (Celtic and Greater North Seas MU)
Bottlenose dolphin	*Tursiops truncatus*	0.001	195 (Coastal East Scotland MU)
White-beaked dolphin	*Lagenorhynchus albirostris*	0.047	15,895 (Celtic and Greater North Seas MU)
Risso's dolphin	*Grampus griseus*	No sightings therefore no density estimate	No current abundance estimate available for this species (Celtic and Greater North Seas MU)
Harbour porpoise	*Phocoena phocoena*	0.293	227,298 (North Sea MU)

5 RISK ASSESSMENT

There is potential for cetacean EPS to be impacted during the UXO clearance work at EOWDC.

The main potential routes to impact are considered to be:

- Increased anthropogenic noise from the UXO clearance work;
- Increased anthropogenic noise from the ROV's geophysical survey systems;
- Increased vessel noise; and
- Collision with vessels.

5.1 Anthropogenic Noise Related Risk Assessments

Two impact routes have been identified which result from increased anthropogenic noise in the marine environment (increased anthropogenic noise from the UXO clearance work and increased vessel noise). Due to the high sensitivity of marine mammals to noise impacts, additional background information is presented on marine mammal hearing sensitivities and thresholds.

Background – Marine Mammal Hearing Sensitivities and Thresholds

It is widely documented that marine mammals are sensitive to underwater noise, with the sensitivity of marine mammals to noise being dependent on the specific hearing abilities of the species.

The potential effects of noise on marine mammals can be summarised as:

- Lethal effects and physical injury;
- Auditory injury; and
- Behavioural response.

The following thresholds have been used for assessing the potential impacts of sound from the UXO clearance work on cetacean EPS.

Lethal Effects and Physical Injury

Lethal effects may occur where peak to peak levels exceed 240 dB re 1 µPa; physical injury may occur where peak to peak levels exceed 220 dB re 1 µPa (Parvin *et al*., 2007).

Auditory Injury

Underwater sound can cause injury to the auditory system either following a brief exposure to extremely high sound levels, or following more prolonged exposure to lower levels of continuous sound (Richardson *et al*., 1995).

Nedwell *et al.* (2007) suggest the use of a 130 dB_{ht} (species) level as suitable criteria for predicting the onset of traumatic hearing loss in marine mammals. This is similar to that used for human exposure in air.

Southall *et al.* (2007) provide indicative thresholds for Sound Exposure Levels (SELs) that have the potential to cause auditory injury (Permanent Threshold Shift – PTS and Temporary

Threshold Shift – TTS) in marine mammals. These thresholds are based on unweighted, instantaneous peak sound pressure levels (SPLs) and M-weighted SELs, where:

- SEL: expression of total energy of a sound wave which incorporates both the sound pressure level and duration; and
- M-weighted function: frequency weighting applied to the SEL allowing functional hearing bandwidths of different marine mammal groups (e.g. harbour porpoise vs. bottlenose dolphin) taking a relevant or derived species audiogram into account.

Thresholds of 198 dB re 1 μPa^2-s are defined by Southall *et al.* (2007) for all cetacean groups exposed to pulsed noise and 215 dB re 1 μPa^2-s for non-pulsed noise for predicting thresholds for the onset of PTS.

More recent work (King, 2013) undertaken on behalf of the Department for Energy and Climate Change (DECC) reviewed the Southall *et al.* (2007) report in light of updated studies and found that the thresholds required updating. The study found that certain species (e.g. harbour porpoise) are more susceptible to TTS as a result of noise exposure, whilst other odontocetes such as bottlenose dolphins are likely to have higher thresholds. As such, King (2013) recommends the use of species dependant ranges of 162–183 dB re 1μPa^2-s for TTS onset and 177-198 dB re 1μPa^2-s for PTS onset to indicate significant impacts for pulsed noise.

The US National Marine Fisheries Service (NMFS) issued guidance for assessing the effects of anthropogenic sound on marine mammal hearing in 2016 (NOAA, 2016). These thresholds are different to Southall *et al*.'s (the frequency weighting bands for each hearing group have been refined, and subsequently narrowed), and are presented below in Table 5-1 and Table 5-2 for comparison.

This assessment considers both the well-established Southall *et al*. (2007) thresholds, as well as the more precautionary (and recently published) NOAA (2016) thresholds.

Table 5-1: Comparison of PTS (and TTS in brackets) onset thresholds – SPLs (dB re 1 µPa) – in response to a single pulse exposure (assesses the potential for injury to occur instantaneously)

Functional hearing group	Non-pulsed sound	Pulsed sound	
	Southall *et al*. (2007)	Southall *et al*. (2007)	NOAA (2016)
Low frequency cetacean e.g. minke whale	230 dB re 1 µPa	230 (224)	219 (213)
Mid frequency cetacean e.g. bottlenose dolphin	230 dB re 1 µPa	230 (224)	230 (224)
High frequency cetacean e.g. harbour porpoise	230 dB re 1 µPa	230 (224)	202 (196)

Table 5-2: Comparison of PTS (and TTS in brackets) onset thresholds – SELs (dB re 1 µPa²-s) – in response to a single pulse exposure within a 24 h period (allows assessment of whether the total energy that an animal receives as it flees the area will cumulatively lead to an effect over the period of time assessed)

Functional hearing group	Non-pulsed sound		Pulsed sound		
	Southall *et al*. (2007)	NOAA (2016)	Southall *et al*. (2007)	NOAA (2016)	King (2013)
Low frequency cetacean e.g. minke whale	215 dB re 1 µPa²-s	199 dB re 1 µPa²-s	198 (183)	183 (179)	-
Mid frequency cetacean e.g. bottlenose dolphin	215 dB re 1 µPa²-s	198 dB re 1 µPa²-s	198 (183)	185 (178)	198 (183)
High frequency cetacean e.g. harbour porpoise	215 dB re 1 µPa²-s	173 dB re 1 µPa²-s	198 (183)	155 (153)	~177 (162-171)

Behavioural Response

Table 5-3 presents information on species sensitivity, and therefore likelihood of response, to underwater noise.

Table 5-3: Estimated auditory bandwidth for cetaceans (Southall et al., 2007)

Functional hearing group	Relevant species	Estimated auditory bandwidth (kHz)
Low frequency cetaceans	Minke whale	0.07 - 22
Mid frequency cetaceans	Bottlenose dolphin	0.15 – 160
High frequency cetaceans	Harbour porpoise	0.2 – 180

The dB_{ht} (species) metric (Nedwell *et al*., 2007) has been developed as a means of quantifying the potential for a behavioural effect on a species in the underwater environment. Sound is perceived differently by different species (since they have differing hearing abilities) and therefore the species name must be appended e.g. dB_{ht} (harbour porpoise). Table 5-4 summarises the dB_{ht} assessment criteria for a behavioural response.

Table 5-4: Assessment criteria to estimate the potential responses by EPS to underwater noise (Nedwell et al., 2007)

Level in dB_{ht} (species)	Reaction
0	None
0 to 50	Mild reaction in minority of individuals, probably not sustained
50 to 90	Stronger reaction by majority of individuals, but habituation may limit effect
90 and above	Strong avoidance reaction by virtually all individuals
Above 110	Tolerance limit of sound; unbearably loud
Above 130	Possibility of traumatic hearing damage from single event

5.1.1 Increased anthropogenic noise from the UXO clearance work

Overview of potential impact

The likelihood of encountering different types of UXO within the EOWDC site was assessed most recently in 2016 (ORDTEK, 2016). Given the risks identified, the following most likely and worst case scenarios were identified:

- Most likely scenario: Up to five UXO that need to be cleared/detonated. These could be German World War I buoyant mines and High Explosive bombs arising from World War II. Ordtek has classified these as 'very likely' or 'likely' to be encountered and to have between 50-500 kg Net Explosive Quantity (NEQ), although 50 -70 kg bombs are likely to predominate. Projectiles likely to be encountered in the site are to be relatively small calibre shells of 2-5 kg NEQ.
- Worst case scenario: The identification of up to 20 UXO that need to be cleared/detonated. These could be British World War II buoyant mine, parachute mines, German World War I buoyant mines and High Explosive bombs or projectiles arising from World War II. Estimated worst case is that the largest amount of NEQ to be detonated is approximately 700 kg (German GC mines) however, the Ordtek report classifies the likelihood of encountering this type of UXO as 'very unlikely'.

Following investigation of any targets identified during the pre-clearance geophysical and UXO survey, the number, size and location of any UXO to be cleared by detonation will be confirmed with Marine Scotland Licensing Operations Team (MS LOT) prior to any clearance activities.

Prediction of impact

Under the worst case scenario, the size of the twenty potential UXO that might be identified during the pre-clearance geophysical and UXO survey and require detonation varies up to a maximum of 700 kg, with the most likely sizes being up to 50 kg. Therefore, this risk assessment has been conducted based on UXO of 50 kg NEQ, with contingency for dealing with UXO of up to 700 kg (see section 7.3) i.e. the worst case scenario. The subsea noise assessment (Appendix B of BOWL, 2016) undertaken as part of Beatrice Offshore Wind Farm (BOWL)'s UXO clearance Marine Licence application to determine the range of potential effects on marine mammals during soft start and UXO detonations was used to inform this assessment. In estimating the SEL dose received by marine mammals, the noise assessment has taken into account detonation of the small 'soft start charges'.

Lethal effects and physical injury

The subsea noise assessment (Appendix B of BOWL, 2016) indicates that the potential for lethal effects and physical injury will be localised i.e. within 100 m of the detonation site (see Table 5-5 below).

Table 5-5: Lethal effects/physical injury ranges from peak pressure levels

Charge size (kg)	Estimated impact range (m)
0.05	16
0.1	18
0.15	20
50	81

Auditory injury

The subsea noise assessment (Appendix B of BOWL, 2016) indicates that the potential for auditory injury could occur further afield than the potential for lethal effects and physical injury (see Table 5-6 below). Using the Southall *et al*. (2007) thresholds, the ranges out to which potential effects may occur are relatively small (up to 225 m). However, application of the more precautionary NOAA (2016) thresholds suggests that the potential for auditory injury (from detonation of a 50 kg charge) could occur out to 690 m from the detonation site for low frequency cetaceans (in this case minke whale) and 3.898 km from the detonation site for high frequency cetaceans (in this case harbour porpoise).

For detonation of the three 'soft start charges' followed by detonation of a 50 kg charge, the estimated impact ranges range from 125 m for mid frequency cetaceans (in this case bottlenose dolphin and white-beaked dolphin) to 1 km for low frequency cetaceans (in this case minke whale) and 2 km for high frequency cetaceans (in this case harbour porpoise; see Table 5.7).

Table 5-6: Estimated PTS onset ranges (m) from peak pressure levels

Charge size (kg)	Estimated impact range (m)			
	Southall *et al*. (2007)	NOAA (2016)		
	All cetaceans	Low frequency cetaceans	Mid frequency cetaceans	High frequency cetaceans
Threshold	230 dB re 1 µPa	219 dB re 1 µPa	230 dB re 1 µPa	202 dB re 1 µPa
0.05	43	132	43	748
0.1	51	156	51	883
0.15	56	172	56	973
50	225	690	225	3,898

Table 5-7: Estimated PTS onset ranges (m) from cumulative SELs (NOAA (2016) thresholds)

Charge size (kg)	Low frequency cetaceans	Mid frequency cetaceans	High frequency cetaceans
Threshold	183 dB re 1 μPa^2s	185 dB re 1 μPa^2s	155 dB re 1 μPa^2s
Soft start (0.05 + 0.1 + 0.15) + 50	1,000	125	2,000

The numbers of individuals (and percentages of species' reference populations) which have the potential to be exposed to noise levels sufficient to induce the onset of PTS (i.e. auditory injury) have been calculated for those species considered to occur regularly in the Aberdeen

Bay area (see Tables 5-8 to 5-11 below). No calculations have been made for Risso's dolphin because no current density or reference population abundance estimates are available for this species (see section 4).

The only species for which the number of individuals which have the potential to be exposed to noise levels sufficient to induce the onset of PTS (from detonation of the three 'soft start charges' followed by detonation of a 50 kg charge) is greater than or equal to one (when applying the more precautionary NOAA (2016) thresholds) is harbour porpoise (see Table 5-11).

Table 5-8: Estimated number of minke whales (a low frequency cetacean) and % of reference population which have the potential to be impacted (by PTS onset)

Charge size (kg)	Southall *et al*. (2007)		NOAA (2016)	
	Number	%	Number	%
0.05	< 1	< 0.001%	< 1	< 0.001%
0.1	< 1	< 0.001%	< 1	< 0.001%
0.15	< 1	< 0.001%	< 1	< 0.001%
50	< 1	< 0.001%	< 1	< 0.001%
Soft start (0.05 + 0.1 + 0.15) + 50	-	-	< 1	< 0.001%

Table 5-9: Estimated number of bottlenose dolphins (a mid frequency cetacean) and % of reference population which have the potential to be impacted (by PTS onset)

Charge size (kg)	Southall *et al*. (2007)		NOAA (2016)	
	Number	%	Number	%
0.05	< 1	< 0.001%	< 1	< 0.001%
0.1	< 1	< 0.001%	< 1	< 0.001%
0.15	< 1	< 0.001%	< 1	< 0.001%
50	< 1	< 0.001%	< 1	< 0.001%
Soft start (0.05 + 0.1 + 0.15) + 50	-	-	< 1	< 0.001%

Table 5-10: Estimated number of white-beaked dolphins (a mid frequency cetacean) and % of reference population which have the potential to be impacted (by PTS onset)

Charge size (kg)	Southall *et al*. (2007)		NOAA (2016)	
	Number	%	Number	%
0.05	< 1	< 0.001%	< 1	< 0.001%
0.1	< 1	< 0.001%	< 1	< 0.001%
0.15	< 1	< 0.001%	< 1	< 0.001%
50	< 1	< 0.001%	< 1	< 0.001%
Soft start (0.05 + 0.1 + 0.15) + 50	-	-	< 1	< 0.001%

Table 5-11: Estimated number of harbour porpoises (a high frequency cetacean) and % of reference population which have the potential to be impacted (by PTS onset)

Charge size (kg)	Southall *et al*. (2007)		NOAA (2016)	
	Number	%	Number	%
0.05	< 1	< 0.001%	1	< 0.001%
0.1	< 1	< 0.001%	1	< 0.001%
0.15	< 1	< 0.001%	1	< 0.001%
50	< 1	< 0.001%	14	0.006%
Soft start (0.05 + 0.1 + 0.15) + 50	-	-	4	0.002%

It is also important to consider TTS. This is because the sound levels that cause TTS can be approximated to those which cause the onset of fleeing behaviour (i.e. by animals to avoid possible injury; BOWL, 2016). Table 5-12, therefore, provides estimates of the distances from which animals will start to flee in response to detonation of the small 'soft start charges'. For harbour porpoises, which belong to the most sensitive hearing group (high frequency cetaceans), animals are predicted to have fled beyond 1,793 m from the detonation site by the time the main detonation (i.e. detonation of the UXO itself) takes place. It is considered likely that the fleeing effect will occur beyond this TTS zone (BOWL, 2016).

Table 5-12: Estimated TTS onset ranges (m)

Charge size (kg)	Estimated impact range (m)			
	Southall *et al*. (2007)	NOAA (2016)		
	All cetaceans	Low frequency cetaceans	Mid frequency cetaceans	High frequency cetaceans
0.05	80	244	80	1,379
0.1	94	288	94	1,627
0.15	103	317	103	1,793
50	414	1,271	414	7,184

Because an ADD will also be used for mitigation (for a period of 30 minutes prior to the 'soft start charges'; see section 7), porpoises are predicted to be no closer than 1.62 km to the detonation site when the first 'soft start charge' is detonated. This number was calculated using the mean swim speed (of 0.9 m per second) reported by Otani *et al*. (2000). If the fastest speed (of 4.3 m per second) reported by Otani *et al*. (2000) is used to make this calculation, porpoises are predicted to be no closer than 7.74 km to the detonation site following use of an ADD. It is likely that porpoises will move further than 1.62 km from the detonation site in response to use of an ADD (the Otani data were collected under 'normal' conditions i.e. not in response to a specific auditory stimulus). However, porpoises may not move as far as 7.74 km from the detonation site because the fastest swim speed recorded by Otani *et al*. (2000) may not be sustainable over longer periods.

Behavioural response

Due to the very short duration and likely small number of potential acoustic events during the UXO clearance work, significant behavioural effects are likely to only occur in the very short

term. A study looking at the effects of a commercial two-dimensional seismic survey on cetaceans in the Moray Firth found that fine-scale behavioural responses by harbour porpoise to noise from seismic airguns occurred during the surveys, but that animals were typically detected again at affected sites within a few hours (Thompson *et al*., 2013). Therefore, following cessation of each detonation event, it is considered likely that any behavioural effects will be reversible and that animals will resume normal behaviour within the short term. Therefore, for this assessment, the potential for behavioural effects as a result of increased anthropogenic noise from the UXO clearance work has not been considered further.

Significance of potential impact

The UXO clearance work has the potential to cause auditory injury to marine mammals if they are in the vicinity of the detonation site when the UXO are detonated. However, through implementation of a comprehensive mitigation plan (which adheres to the JNCC guidelines for minimising the risk of injury to marine mammals from using explosives (JNCC, 2010); see section 7), it is considered that the potential for this effect will be **minor**. No auditory injury will occur within the 1 km mitigation zone (because pre-detonation searches will be conducted), and is unlikely to occur within 1.62 km of the detonation site (because animals are predicted to move away to at least this distance following use of an ADD) or 1.793 km of the detonation site (because animals are predicted to have fled beyond this distance in response to detonation of the 'soft start charges'). However, it is possible that PTS onset could occur beyond this point (using the more precautionary NOAA thresholds, the estimated PTS onset range from cumulative SELs is 2 km for high frequency cetaceans).

Conclusions

Following the 2014 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2014) entitled "The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters", there is potential for (auditory) injury to marine EPS, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from increased anthropogenic noise from the UXO clearance work.

Therefore an EPS licence will be required for this potential impact (increased anthropogenic noise from the UXO clearance work).

It is considered that a licence can be granted because the three tests relating to the requirements of Regulation 44 of the Habitats Regulations which must be passed before a licence can be granted (detailed in section 3) have been satisfied (see section 6).

5.1.2 Increased anthropogenic noise from use of the ROV's geophysical survey systems

Overview of potential impact

As described in section 2.2 above, an ROV will be used to for anomaly investigation to verify UXOs/non-UXOs and to relocate UXO and/or deliver donor charges. ROVs are equipped with geophysical survey systems that could be utilised during this undertaking. Geophysical survey systems increase levels of anthropogenic noise in the marine environment because

they operate by producing and receiving sound. This increase in anthropogenic noise has the potential to affect marine mammals occurring in the Aberdeen Bay area due to the sensitivity of marine mammal hearing (see section 5.1 above). As sound travels much further underwater compared to airborne noise, the resulting effects on marine mammals can be at distance from the sound source.

Numerous studies have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometres, but the relative responsiveness of baleen and toothed cetaceans can be variable.

Prediction of impact

The frequencies of the sound produced by the ROV's geophysical survey systems are given in Table 5-13. The sound produced by each of the ROV's geophysical survey systems will not be audible to marine mammals because it is outwith their estimated auditory bandwidth (see Table 5-3).

Table 5-13: Geophysical survey equipment carried by the ROV

Piece of equipment	Frequency (kHz)
Imaging sonar	Greater than 600 (normally 700 to 1200)
Multi beam echo sounder	200 to 400
Side scan sonar	300 to 900

Significance of potential impact

Because the sound produced by each of the ROV's geophysical survey systems is outwith their estimated auditory bandwidth (see Table 5-3) and therefore not audible to marine mammals, there is **no potential** for cetacean EPS to be disturbed as a result of increased anthropogenic noise from use of the ROV's geophysical survey systems. The potential for auditory injury is considered to be negligible.

Conclusions

Following the 2014 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2014) entitled "The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters", it is considered that there is negligible risk of injury or disturbance to marine EPS, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from increased anthropogenic noise from use of the ROV's geophysical survey systems.

No offence will be committed under section 39 of the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) and therefore an EPS licence will not be required for this potential impact (increased anthropogenic noise from use of the ROV's geophysical survey systems).

5.1.3 Increased vessel noise

Overview of potential impact

Increased vessel noise has the potential to cause behavioural responses in marine mammals, physical impacts such as permanent or temporary hearing loss, and mask naturally occurring sounds. Additionally, increased noise from vessels has the potential to impact marine mammal prey species. Noise varies from vessel to vessel; different vessels will generate different frequency characteristics and sound levels depending upon factors such as the propulsion system they are using.

The proposed anomaly investigation work involves the use of one vessel (an ROV/dive support vessel) for between one to six months. The vessel will either be stationary or transiting at slow speeds during the proposed anomaly investigation work.

The proposed UXO clearance work involves the use of two vessels (an ROV/dive support vessel and a guard vessel; see section 2.2) for a short period (likely to be 20 non-consecutive days given suitable weather conditions; see section 2.3). The vessels will either be stationary or transiting at slow speeds during the proposed UXO clearance work.

Prediction of impact

Predicted dB_{ht} (species) impact ranges for medium sized vessels (less than 100 m in length) which are underway are relatively small compared to other activities (ICOL, 2013).

Significance of potential impact

Noise from vessels present during the proposed UXO clearance work is very unlikely to cause avoidance reactions by marine mammals because the vessels will be stationary or transiting at slow speeds for the majority of the time.

The potential impact of increased vessel noise on EPS is therefore considered to be **negligible**.

Conclusions

Following the 2014 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2014) entitled “The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters”, there is negligible potential for injury or disturbance to marine EPS, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from increased vessel noise associated with the proposed UXO clearance work.

No offence will be committed under section 39 of the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) and therefore an EPS licence will not be required for this potential impact (increased vessel noise).

5.2 Non-Anthropogenic Noise Related Risk Assessments

5.2.1 Collision with vessels

Overview of potential impact

Vessel strikes are a known cause of mortality in marine mammals and basking sharks (Laist *et al*., 2001). Non-lethal collisions have also been documented (Laist *et al*., 2001; Van Waerebeek *et al*., 2007). Injuries from such collisions can be divided into two broad categories: blunt trauma from impact and lacerations from propellers. Injuries may result in individuals becoming vulnerable to secondary infections or predation.

Avoidance behaviour by cetaceans is often associated with fast, unpredictable boats such as speedboats and jet-skis (Bristow and Reeves, 2001; Gregory and Rowden, 2001; Leung Ng and Leung, 2003; Buckstaff, 2004), while neutral or positive reactions have been observed with larger, slower moving vessels such as cargo ships (Leung Ng and Leung, 2003; Sini *et al*., 2005).

There is recreational boat traffic off the coast at Aberdeen, particularly during the summer months.

Prediction of impact

The proposed anomaly investigation work involves the use of one vessel (an ROV/dive support vessel) for between one to six months. The vessel will either be stationary or transiting at slow speeds during the proposed anomaly investigation work.

The proposed UXO clearance work involves the use of two vessels (an ROV/dive support vessel and a guard vessel; see section 2.2) for a short period (likely to be 20 non consecutive days given suitable weather conditions; see section 2.3). The vessels will either be stationary or transiting at slow speeds during the proposed UXO clearance work.

Significance of potential impact

Given the proposed behaviour of the vessels associated with the proposed anomaly investigation and UXO clearance work, the potential for collision with marine EPS is considered to be **negligible**.

Conclusions

Following the 2014 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2014) entitled “The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters”, there is negligible potential for injury or disturbance to marine EPS, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from collision with vessels associated with the proposed UXO clearance work.

No offence will be committed under section 39 of the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) and therefore an EPS licence will not be required for this potential impact (collision with vessels).

5.2.2 Indirect effects

There is potential that the proposed UXO clearance work may result in a small number of indirect effects on marine mammals (see Table 5-14 below).

However, significance of these potential effects is deemed to be **negligible** (see Table 5-14).

Therefore no offence will be committed, no mitigation is considered to be necessary, and an EPS licence will not be required for these potential impacts (indirect effects).

Table 5-14: Assessment of potential indirect effects of the proposed UXO clearance work at EOWDC

Cause of potential indirect effect	Prediction	Significance
Sediment disturbance	Predicted to be highly localised and therefore will not result in significant areas of seabed being disturbed.	**Negligible**
Localised increases in suspended sediment concentrations	Predicted to be highly localised and therefore will not result in significant levels of sediment being released into the water column. Following disturbance, levels of suspended sediment are not expected to be significantly greater than background levels and are likely to settle back to the seabed relatively rapidly. In addition, mobile marine mammal species are able to avoid localised areas disturbed by increased suspended sediment concentration. Furthermore, the mitigation measures being put in place to address potential impacts from noise (see sections 7.2 and 7.3) will cause animals to flee the area such that they are unlikely to be exposed to localised increases in suspended sediment concentrations.	**Negligible**
Release of sediment contaminants	Levels of hydrocarbon and metals in sediments across the OWF did not show significant levels of contamination (EOWDC, 2011). As a result of this, and the dispersive and dilutive nature of the environment, any minor elevated levels of contaminants in the water column following UXO clearance work are unlikely to result in adverse effects on marine mammals.	**Negligible**
Changes in fish and shellfish prey resources	Impacts to fish species are considered to not be significant; therefore any potential indirect effects on the marine mammals that target these species are also expected to not be significant.	**Negligible**

6 ASSESSMENT OF POTENTIAL OFFENCE

The UXO clearance work has the potential to cause auditory injury to marine mammals if they are in the vicinity of the detonation site when the UXO are detonated. However, through implementation of a comprehensive mitigation plan (which adheres to the JNCC guidelines for minimising the risk of injury to marine mammals from using explosives (JNCC, 2010); see section 7), it is considered that the potential for this effect will be minor (no auditory injury will occur to marine mammals within the 1 km mitigation zone, but PTS onset could occur beyond this point).

As per section 3, given that the potential for an offence to be committed exists, three tests must be passed before a licence can be granted.

Test 1: There is an overarching European, UK and Scottish policy requirement for sustainable energy supply from renewables. This need is the subject of national planning and energy policy. The consented EOWDC has been consented on this basis and has been subject to a detailed and rigorous EIA in support of its application for consent. In order to protect property and personnel and ensure safe operations during construction works, all UXOs in the EOWDC construction area need to be cleared prior to commencement of work. The UXO clearance work is safety critical to ensure no unexploded ordnance is present in the area. The EPS licence application for UXO clearance to which this document relates is founded on Imperative Reasons of Overriding Public Interest (IROPI) identified in the policy requirement to achieve (or exceed) the set targets for energy from renewables. The consented EOWDC is of national importance in relation to delivering these policy requirements. AOWFL considers that the UXO clearance work will facilitate the sustainable and safe construction of the EOWDC, and therefore meets the IROPI test.

Test 2: Potential alternatives to the proposed UXO clearance work have been considered by AOWFL as outlined in section 2.2. In summary, consideration will be given to whether it is possible to re-route cables or micro-site wind farm infrastructure in order to avoid UXO. In the event that this is not possible, consideration will be given to moving the UXO. Detonation by controlled explosion will only be used as a last resort should neither avoidance nor removal of UXO be considered possible. The proposed methods outlined in this document (section 2.2) are the only viable way to achieve the UXO clearance work required to enable the safe construction of the EOWDC. AOWFL considers that, on the basis of health and safety, the 'no satisfactory alternative test' has been met.

Test 3: As injurious effects will be mitigated (see section 7), and given that any behavioural effects will be very short term and reversible (see section 5.2.2), each population of marine mammal species occurring in Aberdeen Bay is likely to continue 'maintaining itself on a long-term basis as a viable element of its natural habitats', as defined by the first FCS test (see section 3). Similarly, the UXO clearance activities will not reduce the ranges of populations of marine mammal species occurring in Aberdeen Bay, with the 'natural range of the species neither being reduced nor likely to be reduced for the foreseeable future', as defined by the second FCS test. As disturbance will constitute discrete, short term, reversible events only,

with animals returning to the area in the short term, it is predicted that the third FCS test, namely that ‘there is, and will probably continue to be, a sufficiently large habitat to maintain populations on a long-term basis’, will also be satisfied.

The information provided within this document demonstrates that the three tests detailed in section 3 have been satisfied in line with the requirements of Regulation 44 of the Habitats Regulations, fulfilling the requirement for issuing an EPS licence for UXO clearance work at EOWDC.

7 MARINE MAMMAL MITIGATION PLAN

The JNCC explosives guidelines (JNCC, 2010) reflect best practice and it is considered that adherence to the mitigation measures described below will minimise the risk of committing an offence (causing auditory injury to marine mammals when the UXO are detonated).

These mitigation measures (for cetacean EPS) are also deemed to be appropriate for seals.

7.1 Pre-detonation Searches

Detonations will only take place during daylight hours, in good visibility and in good sea conditions (ideally in sea states of less than or equal to three) to provide good conditions for conducting the pre- and post-detonation searches.

The MMOs/PAM operators will be stationed on board the ROV/dive support vessel, which will be located approximately 100 m from the source during the entire pre-detonation search period.

Visual and passive acoustic pre-detonation searches of a 1 km radius mitigation zone will be conducted for a minimum of one hour. If logistics and the PAM equipment allow, the duty PAM operator will (a) ascertain whether the ADD (see section 7.2) is working and report their findings to the ADD operator and (b) record the soft start (see section 7.3) and UXO detonations to help inform future UXO clearance work.

The duty/lead MMO and PAM operator will communicate with the appropriate Explosive Ordnance Disposal (EOD) personnel (a) if marine mammals are detected during the pre-detonation searches to advise that the next event in the sequence (i.e. use of an ADD - see section 7.2) must be delayed or (b) to confirm that no marine mammals have been detected within the mitigation zone during the pre-detonation searches (or that any animals detected have not been detected again for 20 minutes as per JNCC (2010)) and therefore that the next event in the sequence (use of an ADD) may start.

As far as possible, the MMOs/PAM operators will continue to monitor the mitigation zone during ADD use, soft start detonations and detonation of the UXO.

MMOS will be trained (i.e. JNCC MMO certified), have at least three years' experience and be familiar with the identification, and normal behaviour, of the marine mammal species likely to be encountered in Aberdeen Bay. PAM operators will also be suitably trained, and have an appropriate level of experience of conducting PAM for mitigation.

7.2 Use of an ADD

Following an assessment of the potential effectiveness of candidate devices on the marine mammals species likely to be present in the EOWDC area (as per JNCC (2010)), an appropriate ADD will be deployed by the 'guard vessel' (stationed approximately 100 m from the target location) for 30 minutes prior to detonation. It may be appropriate to extend this 30 minute period to encourage/give animals time to move out to and beyond the ~4 km 'deterrence

zone' (based on the largest predicted injury range from a 50 kg UXO i.e. the 3.898 km predicted injury range for high frequency cetaceans using the precautionary NOAA threshold). However, as per JNCC (2010), the introduction of additional noise will be minimised.

The ADD will be tested in collaboration with the PAM operator using the PAM gear deployed from the ROV/dive support vessel before she moves to the edge of the 1.5 km navigational safety zone in order to ensure that it is working. The backup ADD will also be tested periodically.

In the event of pauses of ten minutes on greater (e.g. due to technical difficulties with the ADD), the 30 minute period will be restarted.

The dedicated ADD operator will be suitably trained and have an appropriate level of experience.

7.3 'Soft Start Charges'

Prior to detonation, the guard vessel will deploy three small 'soft start charges' (which increase in size from 0.05 to 0.15 kg) at five minute intervals over a 15 minute period[2] to continue to encourage/give animals time to move out to and beyond the ~4 km 'deterrence zone'.

Therefore the total duration of 'deterrence activities' (use of ADD and 'soft start charges') will be 45 minutes.

Noting that there is potential (albeit with a low likelihood) for larger UXOs to require detonation, an extension to the soft start phase (through the deployment of slightly larger charges in order to elicit a fleeing response over a greater distance) will be implemented. For the unlikely scenario of 50 to 250 kg UXOs requiring detonation, one additional small charge of 200 g will be added to the soft start sequence. For the very unlikely scenario of 250 to 700 kg UXOs requiring detonation (700 kg is the largest possible size of UXO), two additional small charges of 200 g and 250 g will be added to the soft start sequence.

7.4 Post-detonation Searches

Following detonation, the ROV/dive support vessel will return to the detonation site and visual and passive acoustic searches of the 1 km radius mitigation zone will be conducted for a minimum of fifteen minutes (as per JNCC (2010)).

7.5 Communication Plan

A communication plan outlining when and how the duty/lead MMO, PAM operator, ADD operator and appropriate EOD personnel will be required to communicate will be put in place prior to the UXO clearance work commencing.

[2] In the unlikely event of UXOs greater than 50 kg requiring detonation, the soft start sequence will be extended with additional slightly larger charges and in agreement with the statutory authorities.

7.6 Reporting

A log of all MMO/PAM operator searches and UXO clearance operations will be kept (using the JNCC Marine Mammal Recording Forms[3]).

Following completion of the UXO clearance work, AOWFL will submit a report to MS LOT which will include the following:

- The completed Marine Mammal Recording Forms;
- The dates, locations and details of activity;
- Details of all pre-detonation surveys including information about any marine mammals detected; and
- Details of any technical problems encountered and actions taken.

The Marine Noise Registry close-out report (https://mnr.jncc.gov.uk/) will also be completed.

[3] http://jncc.defra.gov.uk/marine/seismic_survey

8 CONCLUSIONS

This assessment of the potential for impacts on cetacean EPS from activities associated with the proposed UXO clearance work at EOWDC (increased anthropogenic noise from the UXO clearance work, increased anthropogenic noise from use of the ROV's geophysical survey systems, increased vessel noise, collision with vessels and indirect effects) from a worst case scenario concluded that, post-mitigation (pre-detonation searches, use of an ADD and 'soft start charges'):

- There was no/negligible potential for lethal effects, physical injury and disturbance to marine EPS; and
- The potential for auditory injury (due to increased anthropogenic noise from the UXO clearance work) is considered to be minor.

Following the 2014 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2014) entitled "The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters", there is potential for (auditory) injury to marine EPS, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from increased anthropogenic noise from the UXO clearance work.

Therefore an EPS licence will be required for this potential impact (increased anthropogenic noise from the UXO clearance work).

It is considered that a licence can be granted because the three tests relating to the requirements of Regulation 44 of the Habitats Regulations which must be passed before a licence can be granted (detailed in section 3) have been satisfied (see section 6).

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