Department of Energy & Climate Change

Offshore Oil & Gas Licensing
27th Seaward Round
West of Shetland

Blocks 206/9b, 206/10b, 206/14

Habitats Regulations Assessment
Appropriate Assessment

November 2013

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Contents

1 Introduction

1.1 Background and purpose

On 1st February 2012, the Secretary of State for the Department of Energy and Climate Change (DECC) invited applications for licences in the 27th Seaward Licensing Round. The Licensing Round forms part of a plan/programme adopted by the Secretary of State following completion of the offshore energy Strategic Environmental Assessment (DECC 2011). Applications for Traditional Seaward, Frontier Seaward and Promote Licences covering over 400 Blocks/part Blocks were received.

To comply with obligations under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended), in summer 2012, the Secretary of State undertook a screening assessment to determine whether the award of any of the Blocks applied for would be likely to have a significant effect on a relevant site, either individually or in combination with other plans or projects (DECC 2012a).

In so doing, the Department has applied the Habitats Directive test (elucidated by the European Court of Justice in the case of Waddenzee (Case C-127/02)) which test is:

> Any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects.
>
> Where a plan or project not directly connected with or necessary to the management of the site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light, *inter alia*, of the characteristics and specific environmental conditions of the site concerned by such a plan or project.

A screening assessment (including consultation with the statutory agencies/bodies) forming the first stage of the Habitats Regulations Assessment (HRA) process, identified 61 whole or part Blocks as requiring further assessment prior to decisions on whether to grant licences (DECC 2012a). Because of the wide distribution of these Blocks around the UKCS, the Appropriate Assessments (AA) in respect of each potential licence award, are contained in seven regional reports as follows:

- Southern North Sea
- Outer Moray Firth
- Central North Sea

- West of Shetland
- Northern Ireland
- Eastern Irish Sea
- Central English Channel

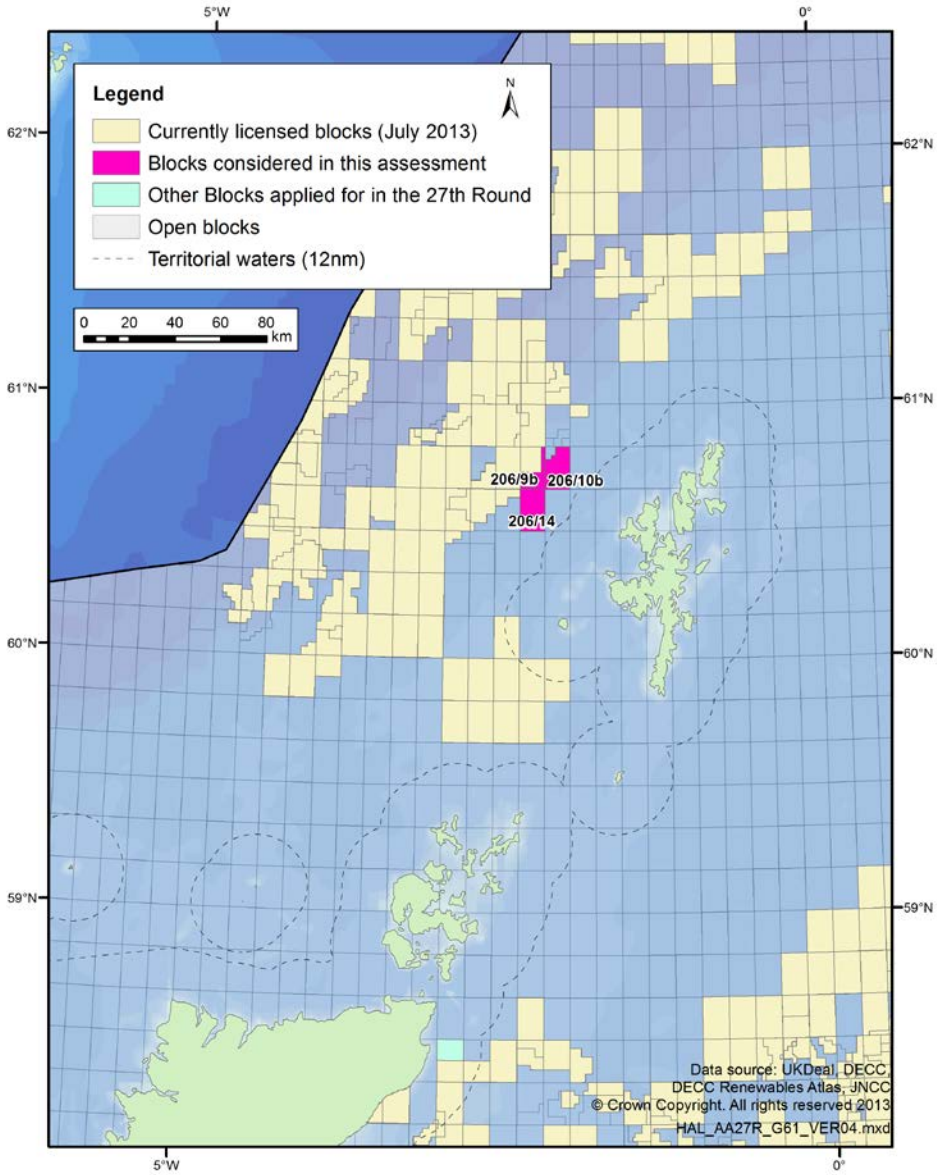
This report documents the further assessment in relation to 3 Blocks to the West of Shetland (see Section 1.2).

1.2 West of Shetland Blocks

The West of Shetland Blocks applied for in the 27th Round considered in this document are listed below and shown in magenta in Figure 1.1

206/9b 206/10b 206/14

Figure 1.1: Location of West of Shetland Blocks



Note: Open blocks are currently unlicensed, although they may have been licensed in the past.

2 Licensing and activity

2.1 Licensing

The exclusive rights to search and bore for and get petroleum in Great Britain, the territorial sea adjacent to the United Kingdom and on the UK Continental Shelf (UKCS) are vested in the Crown and the *Petroleum Act 1998* (as amended) gives the Secretary of State the power to grant licences to explore for and exploit these resources. The main type of offshore Licence is the Seaward Production Licence. Offshore licensing for oil and gas exploration and production commenced in 1964 and has progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence may cover the whole or part of a specified Block or a group of Blocks. A Licence grants exclusive rights to the holders "to search and bore for, and get, petroleum" in the area covered by the Licence, but does not constitute any form of approval for activities to take place in the Blocks, nor does it confer any exemption from other legal or regulatory requirements (see Figure 2.1).

There are three types of Seaward Production Licences:

- Traditional Production Licences are the standard type of Seaward Production Licences and run for three successive periods or Terms. Each Licence expires automatically at the end of each Term, unless the licensee has made enough progress to earn the chance to move into the next Term. The Initial Term lasts for four years and the Licence will only continue into a Second Term of four years if the agreed Work Programme has been completed and if 50% of the acreage has been relinquished. The Licence will only continue into a Third Term of 18 years if a development plan has been approved, and all the acreage outside that development has been relinquished.

- Frontier Production Licences are a variation of the Traditional Production Licence with longer terms. A Frontier Production Licence has a longer Initial Term (six years as opposed to four) with the objective of allowing companies to screen larger areas. After 3 years, the licensee must relinquish 75% of the licensed acreage. At the end of the Initial Term, the exploration Work Programme must have been completed and the licensee must relinquish 50% of what is left (i.e. leaving one eighth of the original licensed area). A variation on the Frontier Production Licence was introduced prior to the 26th Round. Designed for the particularly harsh West of Scotland environment, it is similar to the existing Frontier Licence but with an initial term of nine years with a Drill-or-Drop decision to be made by the end of the sixth year and (if the licensee chooses to drill) drilling to be completed within the remaining three years of the initial term.

- In the 21st Round (2002) the Department introduced Promote Licences. The general concept of the Promote Licence is that the licensee is given two years after award to attract the technical, environmental and financial capacity to complete an agreed Work

Programme. In effect, DECC will defer (not waive) its financial, technical and environmental checks until the preset Check Point. Promote licensees are not allowed to carry out field operations until they have met the full competence criteria. The way this is implemented is that each Promote Licence carries a "Drill-or-Drop" Initial Term Work Programme. The Licence will therefore expire after two years if the licensee has not made a firm commitment to DECC to complete the Work Programme (e.g. to drill a well). By the same point, it must also have satisfied DECC of its technical, environmental and financial capacity to do so.

The model clauses and terms and conditions which are attached to Licences are contained in Regulations.

It is noted that the environmental management capacity and track record of applicants is considered by DECC, through written submissions and interviews, before licences are awarded.

2.2 Activity

As part of the licence application process, applicant companies provide DECC with details of work programmes they propose in the first term to further the understanding or exploration of the Block(s) in question. These work programmes are considered with a range of other factors in DECC's decision on whether to license the Blocks and to whom. There are three levels of drilling commitment:

- A **Firm Drilling Commitment** is a commitment to the Secretary of State to drill a well. Applicants are required to make firm drilling commitments on the basis that, if there were no such commitment, the Secretary of State could not be certain that potential licensees would make full use of their licences. However, the fact that a licensee has been awarded a licence on the basis of a "firm commitment" to undertake a specific activity should not be taken as meaning that the licensee will actually be able to carry out that activity. This will depend upon the outcome of all relevant environmental assessments.

- A **Contingent Drilling Commitment** is also a commitment to the Secretary of State to drill a well, but it includes specific provision for DECC to waive the commitment in light of further technical information.

- A **Drill or Drop (D/D) Drilling Commitment** is a conditional commitment with the proviso, discussed above, that the licence is relinquished if a well is not drilled.

Note that Drill-or-Drop and Contingent work programmes (subject to further studies by the licensees) will probably result in a well being drilled in less than 50% of the cases.

It is made clear in the application guidance that a Production Licence does not allow a licensee to carry out all petroleum-related activities from then on (this includes those activities outlined in initial work programmes). Field activities (see Table 2.1), such as seismic survey or drilling, are subject to further individual controls by DECC (see Figures 2.2-2.3), and a licensee also remains subject to controls by other bodies such as the Health and Safety Executive. It is the licensee's responsibility to be aware of, and comply with, all regulatory controls and legal requirements. The proposed work programmes for the first four-year period (six years in the case of Frontier licences) are detailed in the licence applications. For some activities, such as seismic survey noise and accidental events such as oil spills, the impacts can occur some distance from the licensed Blocks and the degree of activity is not necessarily proportional to the size or number of Blocks in an area. In the case of direct physical disturbance, the licence Blocks being applied

for are relevant, although there may still be pipelines that cross unlicensed Blocks should any significant development ensue after the initial four-year exploratory period.

On past experience, less activity actually takes place than is bid at the licence application stage and a proportion of Blocks awarded may be relinquished without any field activities occurring. The approach used here has been to take the proposed activity for a given Block as being the maximum of any application for that Block, and to assume that all activity takes place as a result of the structuring of licences. The Blocks comprise a single licence and an estimate of work commitments for the Blocks derived by DECC from the application received are as follows:

Block(s)	Initial term work programme	Licence type
206/9b, 206/10b, 206/14	1 contingent well and shoot 3D seismic	**Traditional:** work programme must be carried out and 50% of block acreage relinquished within 4 years, otherwise licence will not continue to second term.

DECC routinely seeks advice from other Government Departments[1] and statutory nature conservation agencies in considering applications for activity approval. On the announcement of each seaward licensing Round, DECC issues a list of "other regulatory requirements", providing guidance on Block specific issues and concerns. Depending on the activity and the nature of the sensitivity, these concerns may affect DECC's decision whether or not to approve particular activities at specified times.

The guidance indicates seasonal concerns for one of the Blocks (206/14) on offer (Table 2.2). Those seasonal concerns identified for seismic survey are related to fish spawning within the months indicated. There is little evidence of well-defined seasonal patterns associated with the abundance and distribution of most cetacean species. It is therefore difficult to single out areas/times for which seismic surveying would be less advisable. DECC recommends[2] that cetacean sensitivity is considered in relation to each individual project, and also advises applicants to seek advice directly from JNCC and Marine Scotland.

[1] DECC strongly advise early consultation with all the organisations relevant to the location and nature of an operator's proposed activities.
[2] DECC 27th Round other regulatory issues.

Table 2.1: Potential activities arising from initial work programmes – note that these descriptions are indicative, and activities would require individual environmental assessment and permitting (see Figures 2.2-2.3)

Potential activity	Description
Geophysical survey	
Deep geological seismic (2D and 3D) survey	2-D seismic involves a survey vessel with a single source and a towed hydrophone streamer. The reflections from the subsurface strata provide an image in two dimensions (horizontal and vertical). Repeated parallel lines are typically run at intervals of several kilometres (minimum ca. 0.5km) and a second set of lines at right angles to the first to form a grid pattern. This allows imaging and interpretation of geological structures and identification of potential hydrocarbon reservoirs. 3D seismic survey is similar but uses more than one source and several hydrophone streamers towed by the survey vessel. Thus closely spaced 2D lines (typically between 25 and 50m apart) can be achieved by a single sail line. 3D survey airgun arrays are normally larger[3] with typical broadband source levels of 248-259db re 1µPa.
Rig site survey	Rig site surveys utilise a range of techniques, including 2-D seismic survey, although for rig site surveys a much smaller energy source and shorter hydrophone streamer is used (with source size of 40-400 cubic inches[3]). The survey typically covers a relatively small area of seabed, in the order of 2km or 3km square. The rig site survey vessel may also be used to gather baseline information on the seabed sediment, fauna, presence of protected habitats and species, and background contamination.
Well evaluation (e.g. Vertical Seismic Profiling)	Sometimes conducted to assist with well evaluation subsequent to drilling. A seismic source (airgun array, typically with a source size of up to ~500 cubic inches[3]) is deployed from onboard the rig, and measurements are made within the wellbore using a series of geophones deployed inside it. VSP produces a relatively high intensity impulse noise, but over a short duration (usually a few hours).
Drilling	
Rig tow out & de-mobilisation	Mobile rigs are towed to and from the well site typically by 2-3 anchor handling vessels.
Rig placement/ anchoring	Semi-submersible rigs use either anchors (deployed and recovered by anchor handler vessels) or dynamic positioning (DP) to manoeuvre into and stay in position over the well location. Eight to 12 anchors attached to the rig by cable or chain are deployed radially at 1 to 1.5km from the rig; part of the anchoring hold is provided by a proportion of the cables or chains lying on the seabed (catenary). A jack up rig is assisted into position by anchor handling vessels, and then the rig's legs are lowered to the seafloor to maintain position. Semi-submersible rigs can either use anchors combined with the assistance from anchor handling vessels, or dynamic positioning (DP) to manoeuvre into and stay in position over the drill site.

[3] OGP 2011 – An overview of marine seismic operations.

Potential activity	Description
Drilling discharges	Typically around 1,000 tonnes of cuttings result from an exploration well. Water-based mud cuttings are discharged at, or relatively close to sea surface during “closed drilling” (i.e. when steel casing and a riser is in place), whereas surface hole cuttings will be discharged at seabed during “open-hole” drilling. Use of oil based mud systems, for example in highly deviated sections or in water reactive shale sections, would require the onshore disposal or reinjection of a proportion of waste material.
Rig/vessel presence and movement	On site, the rig is supported by supply and standby vessels. Supply vessels typically make 2-3 supply trips per week between rig and shore. Helicopter trips to transfer personnel to and from the rig are typically made several times a week.

Table 2.2: Seasonal and other concerns related to Blocks considered in this Appropriate Assessment

Block	Period of concern for seismic surveys	Special Conditions†
206/9	-	✓
206/10	-	✓
206/14	February-June	✓

Note: † Activity is of concern to the MoD because the Block lies within training ranges.

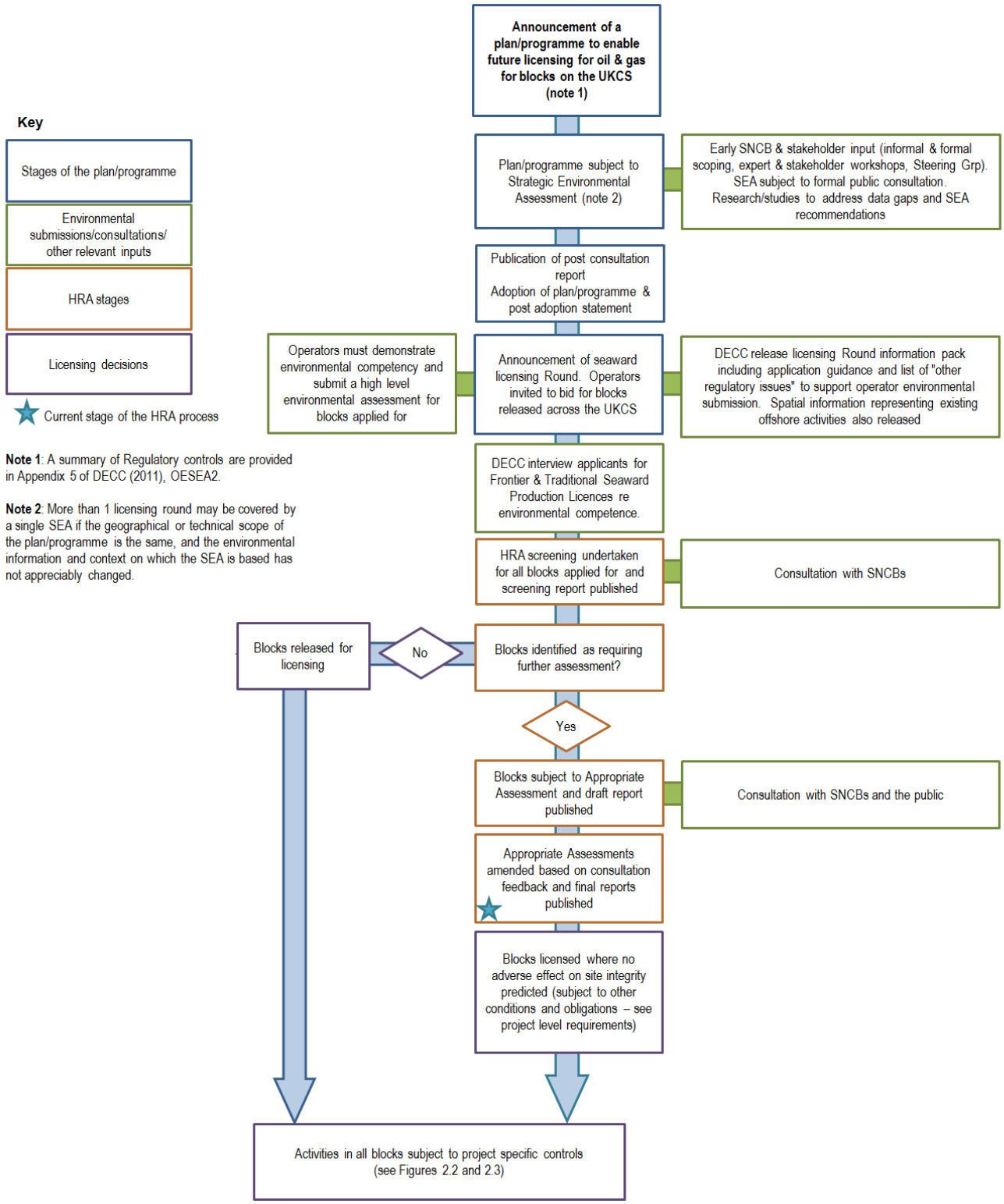
Source: Other regulatory issues (DECC 27th Seaward licensing Round website).

Figure 2.1 provides an overview of the plan process which has led to the 27th Licensing Round and the various environmental requirements including HRA. Figures 2.2 and 2.3 outline the stages for subsequent activities and environmental requirements for the work programmes (drilling and seismic survey) indicated by applicants for the blocks subject to assessment. These simplified flow diagrams indicate other stages of assessment typically undertaken prior to activities being permitted/consented. They figures highlight the regulatory requirements and environmental responsibilities at various stages in the development of the plan or exploration level activity, and further opportunities/requirements for project level environmental assessment and HRA. These Figures show that all activities which could give rise to significant effects on the integrity of relevant sites are subject to regulatory control, including HRA as necessary with consultation with statutory nature conservation bodies. Applications for consent to conduct activities are required to include assessment of potential effects and identification of necessary mitigation measures. There are well proven methods to prevent significant impacts and site specific mitigation would be defined at the project level once the location and nature of activity were defined.

Activity after the initial term is much harder to predict, as this depends on the results of the initial phase, which is, by definition, exploratory. Typically less than half the wells drilled reveal hydrocarbons, and of that half less than half again will yield an amount significant enough to warrant development. Depending on the expected size of finds, there may be further drilling to appraise the hydrocarbons (appraisal wells). Discoveries that are developed may require further drilling, wellhead infrastructure, pipelines and possibly production facilities such as platforms, although most recent developments are tiebacks to existing production facilities rather than standalone developments.

The extent and timescale of development, if any, which may ultimately result from the licensing of these Blocks is therefore uncertain and it is not regarded that a meaningful assessment of development level activity (e.g. pipelay, placement of jackets, subsea templates or floating installations) can be made at this stage for any given block in relation to relevant sites. Any information provided in relation to these activities is for context. All activities as part of exploration, appraisal and development are subject to individual permitting and environmental assessment (incorporating HRA where appropriate) prior to any consent being issued.

Figure 2.1: Environmental obligations for the competent authority when licensing for offshore oil and gas



Note 1: A summary of Regulatory controls are provided in Appendix 5 of DECC (2011), OESEA2.

Note 2: More than 1 licensing round may be covered by a single SEA if the geographical or technical scope of the plan/programme is the same, and the environmental information and context on which the SEA is based has not appreciably changed.

Figure 2.2: High level overview of exploration drilling environmental requirements[4]

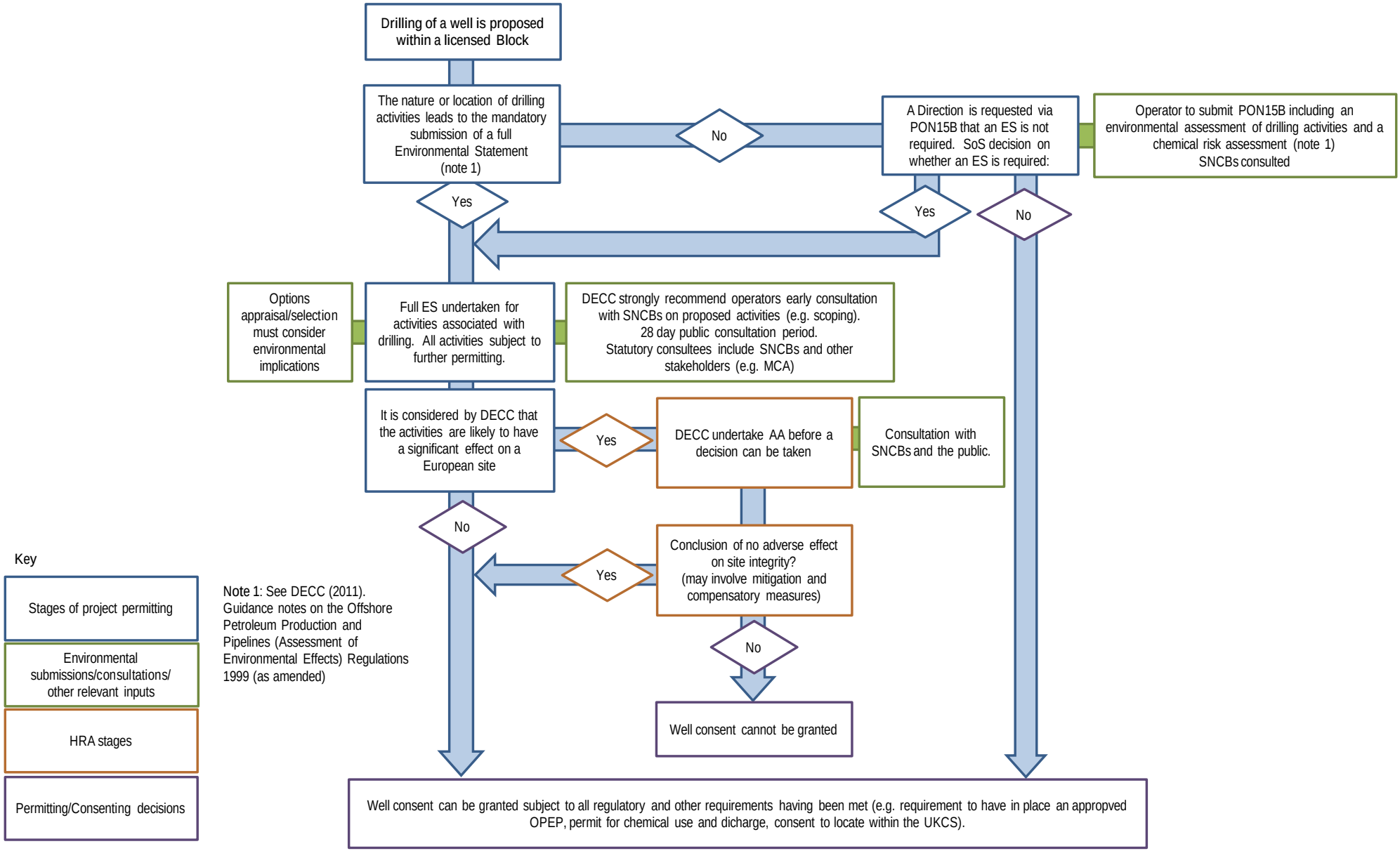
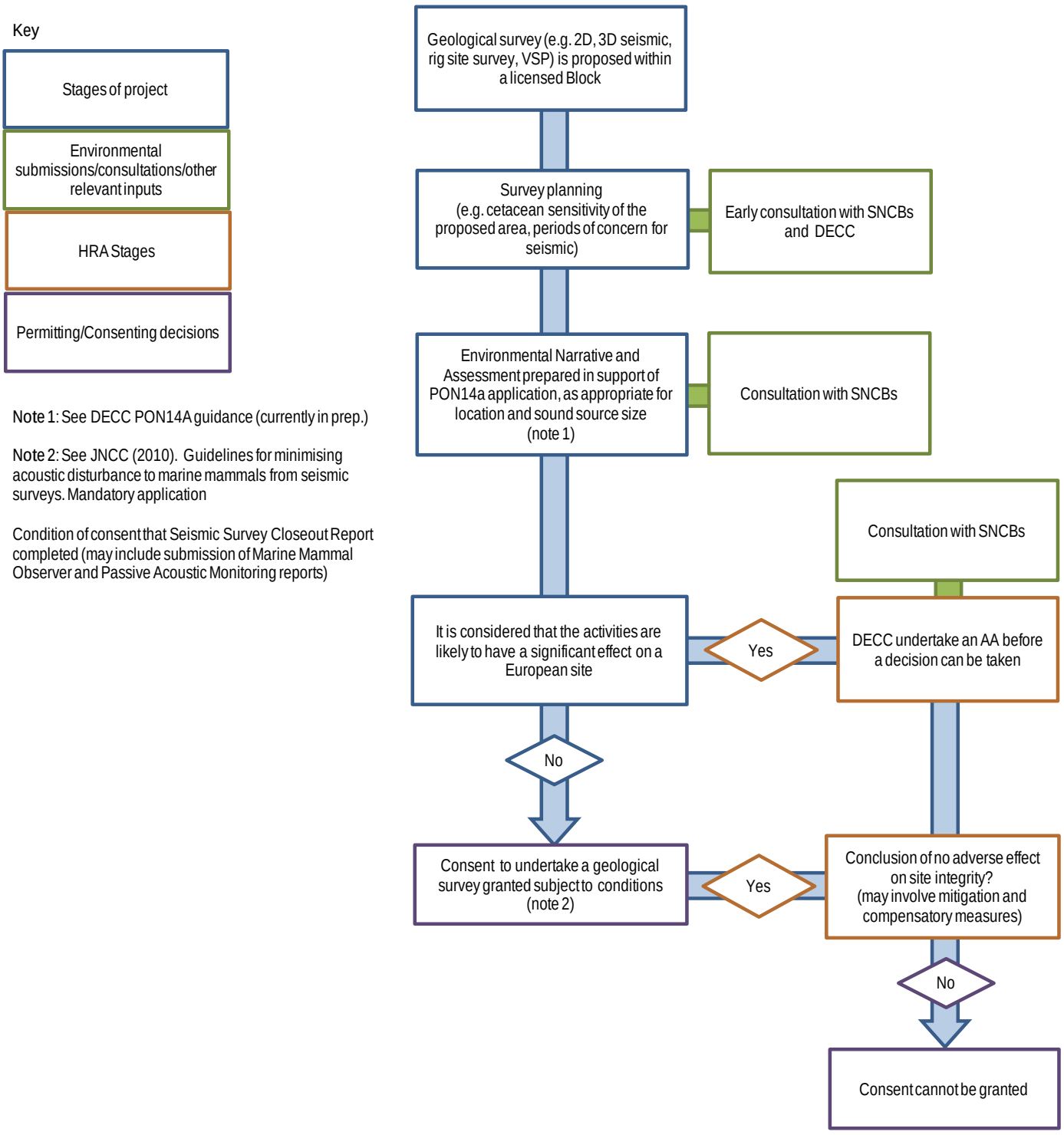


Figure 2.3: High level overview of seismic survey environmental requirements[4]



[4] The PON application processes referred to in Figures 2.2 and 2.3 are presently being replaced with the Portal Environmental Tracking System (PETS). PETS will cover applications including those for Drilling Operations (formerly PON15B) and Marine Survey Notifications and Acoustic Survey Consents (formerly PON14A).

3 Relevant Natura 2000 Sites

The Natura 2000 sites to be considered in this assessment were identified based on their location in relation to the 3 Blocks (see Section 1.2 above) which are the subject of licence applications and in terms of the foreseeable possibility of interactions. Sites considered include designated Natura 2000 sites (also referred to as 'European Sites' and including Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) and potential sites for which there is adequate information on which to base an assessment.

The sites considered are listed and mapped in Appendix A. In accordance with Government policy (as set out in Scottish Planning Policy (Scottish Government 2010) and Marine Policy Statement (HM Government 2011) and revised guidance updating Scottish office Circular No. 6/1995 (Scottish Government 2000), the relevant sites considered include classified and potential SPAs[5], designated and candidate SACs and Sites of Community Importance[6] (SCIs). Additionally, potential interactions between mobile species which are qualifying features of these sites, and work programme activities that may arise from licensing, are considered beyond site boundaries (e.g. foraging seals and seabirds, migratory fish).

The relevant sites are detailed in Appendix A and include:

- Coastal and marine Natura 2000 sites along the Scottish mainland coast and islands from Cape Wrath to East Caithness Cliffs, and Orkney, Shetland and Fair Isle.
- Inland SPAs for breeding red-throated diver (*Gavia stellata*) which forage in neighbouring coastal waters off the Scottish mainland and islands from Cape Wrath to East Caithness Cliffs and Orkney, Shetland and Fair Isle.
- Riverine SACs within the area for migratory fish and/or the freshwater pearl mussel.
- Offshore SACs (i.e. sites located in the UK's offshore marine area[7]) situated to the east of Shetland.

[5] Paragraph 135 of Scottish Planning Policy – note that the SPP and Scottish National Planning Framework 3 were recently subject to consultation and responses are presently being considered. The draft revised SPP maintains the policy that the same level of protection be afforded to potential SACs and SPAs as to designated sites.

[6] Sites of Community Importance (SCIs) are more advanced in designation than cSACs in that they have been adopted by the European Commission but not yet formally designated by the government of the relevant country.

[7] Defined (in the *Offshore Marine Conservation (Natural Habitats, & c.) Regulations, 2007 (as amended)*) as: (a) any part of the seabed and subsoil situated within the UK's Continental Shelf (the area designated under section 1(7) of Continental Shelf Act 1964); and (b) any part of the waters within British fishery limits (except the internal waters of, and the territorial sea adjacent to, the United Kingdom, the Channel Islands and the Isle of Man).

Information gathering is in progress to inform the potential designation of further Natura 2000 sites, for instance the work of Kober *et al.* (2010, 2012) – see Section 7 for a consideration. Should further sites be established in the future, these would be considered as necessary in subsequent project specific assessments. Summaries of sites, together with their features of interest, and location maps are given in Appendix A (Maps A.1 to A.3 and Tables A.1 to A.5).

In addition to European sites, the characteristics of broadscale physical and ecological features in the area are described in the Offshore Energy SEA (DECC 2011), Charting Progress 2 (Defra 2010) and the OSPAR Quality Status Report (OSPAR 2010).

The sites listed in Tables 3.1 to 3.3 and shown in Figures 3.1-3.2 are those taken forward from the block screening assessment (DECC 2012) and have been re-screened in Appendix B in relation to the final Blocks proposed to be taken forward for licensing in the 27th Round and their related work programmes (Section 2.2). Those for which a likely significant effect was identified in the re-screening are highlighted in Tables 3.1 to 3.3 and subject to further assessment in Sections 5-8. Appendix C provides additional site details such as the status of qualifying features and related conservation objectives.

Figure 3.1: SPAs in the West of Shetland area, and those relevant to this Appropriate Assessment

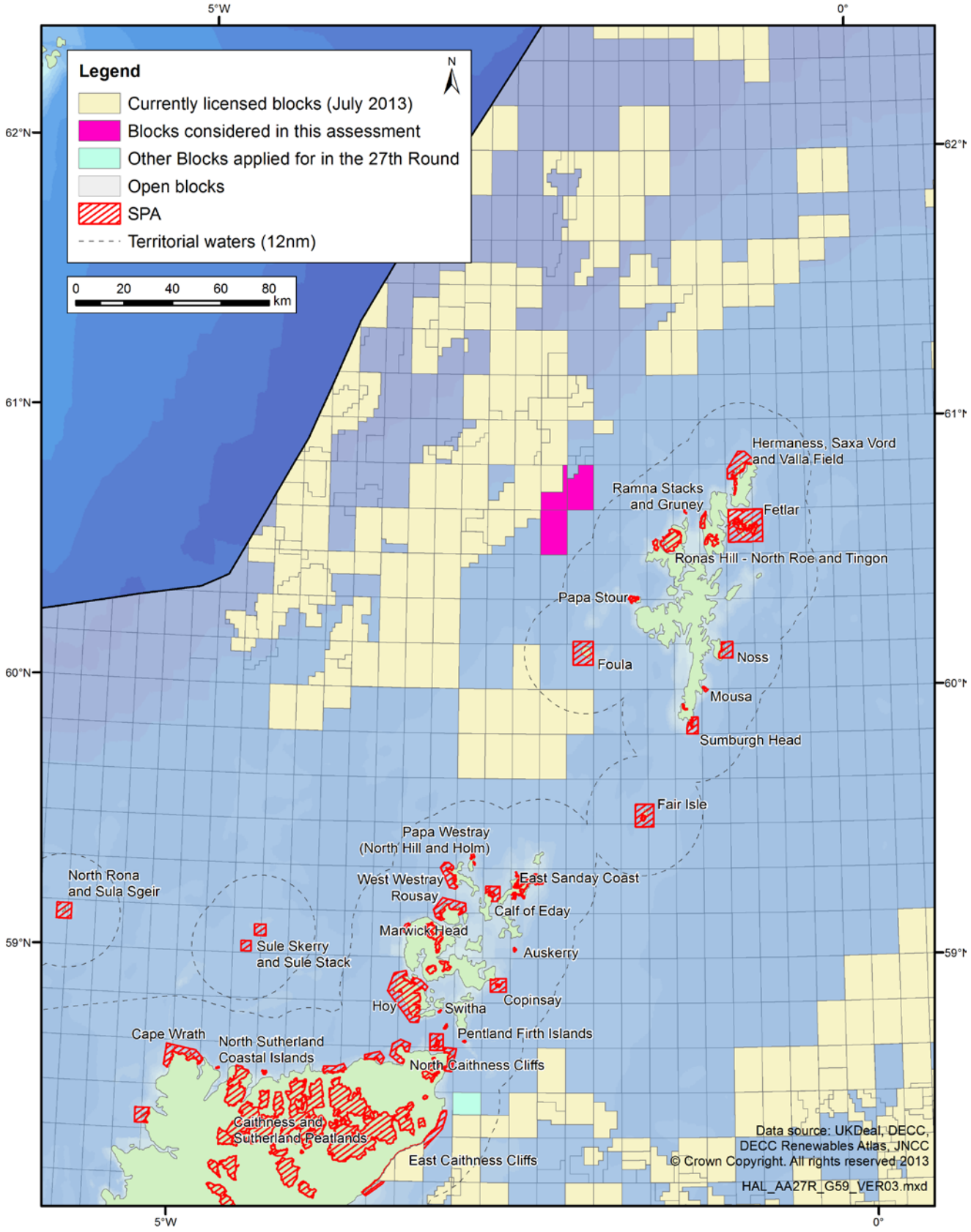


Figure 3.2: SACs in the West of Shetland area, and those relevant to this Appropriate Assessment

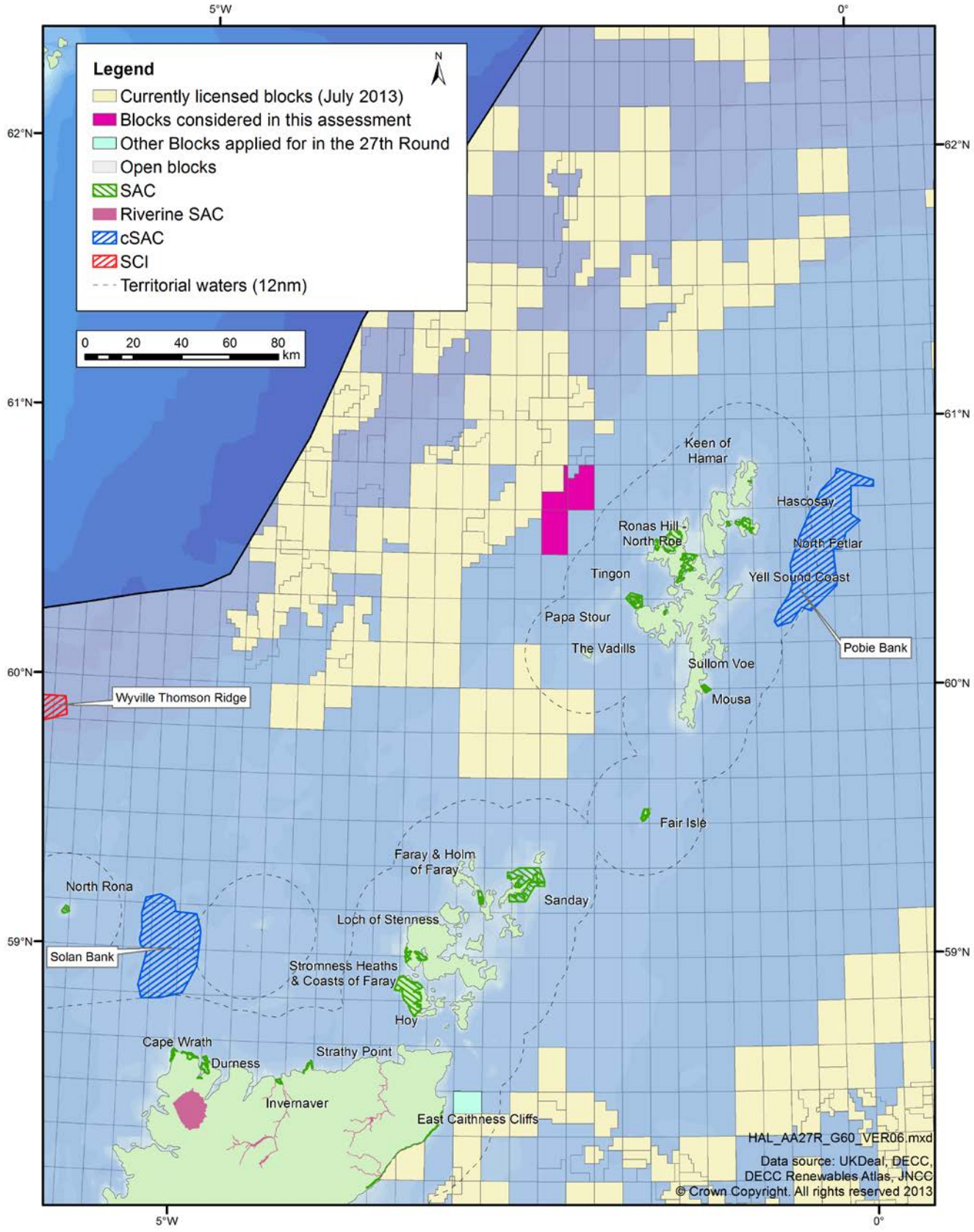


Table 3.1: SPA sites and qualifying features under Article 4.1 and 4.2 in the West of Shetland area, and those relevant to this Appropriate Assessment (see Appendix A for full site details)

Note: B = Breeding, W = Over Wintering, P = On Passage

	Sumburgh Head	Lochs of Spiggie and Brow	Foula	Papa Stour	Ronas Hill-North Roe and Tingon	Ramna Stacks and Gruney	Otterswick and Graveland	Hermaness, Saxa Vord and Valla Field	Fetlar	Noss	Mousa	Fair Isle	Pentland Firth Islands	Switha	Orkney Mainland Moor	Hoy	Marwick Head	Rousay	West Westray	Papa Westray (North Hill and Holm)	Calf of Eday	East Sanday Coast	Auskerry	Copinsay	Sule Skerry and Sule Stack	North Rona and Sula Sgeir	Cape Wrath	North Sutherland Coastal Islands	North Caithness Cliffs	Caithness Lochs	Caithness and Sutherland Peatlands	East Caithness Cliffs
Red-throated diver			B		B		B	B							B	B															B	
Black-throated diver																															B	
Storm petrel											B												B		B	B						
Leach's petrel			B			B																			B	B						
Gannet								B		B															B	B						
Shag			B																													
Guillemot			B							B		B					B		B							B			B			B
Razorbill																										B						B
Puffin			B					B																	B	B						
Arctic skua																				B												
Great skua			B		B			B	B	B						B																
Herring gull																																B
Kittiwake																										B						B
Arctic tern	B		B	B					B		B	B	B					B	B	B			B									
Fulmar																										B						
Great black backed gull																										B						
Hen harrier															B W																B	

	Sumburgh Head	Lochs of Spiggie and Brow	Foula	Papa Stour	Ronas Hill-North Roe and Tingon	Ramna Stacks and Gruney	Otterswick and Graveland	Hermaness, Saxa Vord and Valla Field	Fetlar	Noss	Mousa	Fair Isle	Pentland Firth Islands	Switha	Orkney Mainland Moor	Hoy	Marwick Head	Rousay	West Westray	Papa Westray (North Hill and Holm)	Calf of Eday	East Sanday Coast	Auskerry	Copinsay	Sule Skerry and Sule Stack	North Rona and Sula Sgeir	Cape Wrath	North Sutherland Coastal Islands	North Caithness Cliffs	Caithness Lochs	Caithness and Sutherland Peatlands	East Caithness Cliffs
Golden eagle																															B	
Merlin					B																										B	
Peregrine																B													B			B
Short-eared owl															B																B	
Ringed plover				B																												
Golden plover																															B	
Purple sandpiper																						W										
Dunlin									B																						B	
Bar-tailed godwit																						W										
Whimbrel									B																							
Greenshank																															B	
Wood sandpiper																															B	
Turnstone																						W										
Red-necked phalarope									B																							
Whooper swan		W																												W		
Greenland white-fronted goose																														W		
Icelandic greylag goose																														W		
Barnacle goose														W														W				

	Sumburgh Head	Lochs of Spiggie and Brow	Foula	Papa Stour	Ronas Hill-North Roe and Tingon	Ramna Stacks and Gruney	Otterswick and Graveland	Hermaness, Saxa Vord and Valla Field	Fetlar	Noss	Mousa	Fair Isle	Pentland Firth Islands	Switha	Orkney Mainland Moor	Hoy	Marwick Head	Rousay	West Westray	Papa Westray (North Hill and Holm)	Calf of Eday	East Sanday Coast	Auskerry	Copinsay	Sule Skerry and Sule Stack	North Rona and Sula Sgeir	Cape Wrath	North Sutherland Coastal Islands	North Caithness Cliffs	Caithness Lochs	Caithness and Sutherland Peatlands	East Caithness Cliffs
Wigeon																															B	
Common scoter																															B	
Fair Isle wren												B																				
Assemblage	B		B					B	B	B		B				B	B	B	B		B			B	B	B	B		B			B
Site subject to AA*	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓							

*Note: B = Breeding, W = Over Wintering, P = On Passage, *see Appendices B and C*

Table 3.2: SAC sites and qualifying features under Annex 1 and Annex 2 in the West of Shetland area, and those relevant to this Appropriate Assessment (see Appendix A for full site details)

Annex 1 Habitats	The Vadills	Papa Stour	Tingon	Hascosay	Ronas Hill-North Roe	Sullom Voe	Yell Sound Coast	Keen of Hamar	North Fetlar	Mousa	Fair Isle	Hoy	Loch of Stenness	Stromness Heaths and Coasts	Faray and Holm of Faray	Sanday	Cape Wrath	Durness	Invernaver	Strathy Point	East Caithness Cliffs	North Rona
Sea cliffs											P	P		P			P			P	P	P
Sea caves		P								Q												P
Heaths					P,Q			Q	P		Q	P,Q		P				Q	P			
Bog			P	P	P							P										
Standing freshwater			Q		P							P						P				
Fens									P			Q		Q				Q	Q			
Rocky slopes												Q										
Coastal lagoons	P					Q							P									
Inlets and Bays						P																
Reefs		P				Q				Q						P						P
Sandbanks																Q						
Mudflats and sandflats																Q						
Grasslands								P										P,Q	P			
Scree					Q			P														
Coastal dunes																		P,Q	P,Q			
Limestone pavements																		P				
Site subject to AA*				✓		✓	✓			✓					✓	✓						✓

*Note: P = Primary feature, Q = Qualifying feature, see Appendix C for more details – note that primary and qualifying (secondary) features are treated equally within this assessment. Annex 1 habitats follow nomenclature shown in Box A.2 (Appendix A2) * see Appendices B and C.*

Annex 2 Species	The Vadills	Papa Stour	Tingon	Hascosay	Ronas Hill-North Roe	Sullom Voe	Yell Sound Coast	Keen of Hamar	North Fetlar	Mousa	Fair Isle	Hoy	Loch of Stenness	Stromness Heaths and Coasts	Faray and Holm of Faray	Sanday	Cape Wrath	Durness	Invernaver	Strathy Point	East Caithness Cliffs	North Rona
Grey seal															P							P
Harbour seal							P			P						P						
Otter				Q			P											Q				
Site subject to AA*				✓		✓	✓			✓					✓	✓						✓

*Note: P = Primary feature, Q = Qualifying feature. * see Appendices B and C. Note that primary and qualifying (secondary) features are treated equally within this assessment.*

Table 3.3: Riverine SACs designated for migratory fish and/or the freshwater pearl mussel in the West of Shetland area, and those relevant to this Appropriate Assessment

	Foinaven	River Borgie	River Naver	River Thurso	Berriedale and Langwell Waters
Freshwater pearl mussel	Q	P	P		
Otter	Q	Q			
Atlantic salmon		Q	P	P	P
Site subject to AA*		✓	✓	✓	✓

Note: P = Primary feature, Q = Qualifying feature, see Appendix C for more details – note that primary and qualifying (secondary) features are treated equally within this assessment.

4 Assessment of the effects of the plan on site integrity

4.1 Process

In carrying out this AA so as to determine whether it is possible to grant licences in accordance with Regulation 5(1) of *The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended), DECC has:

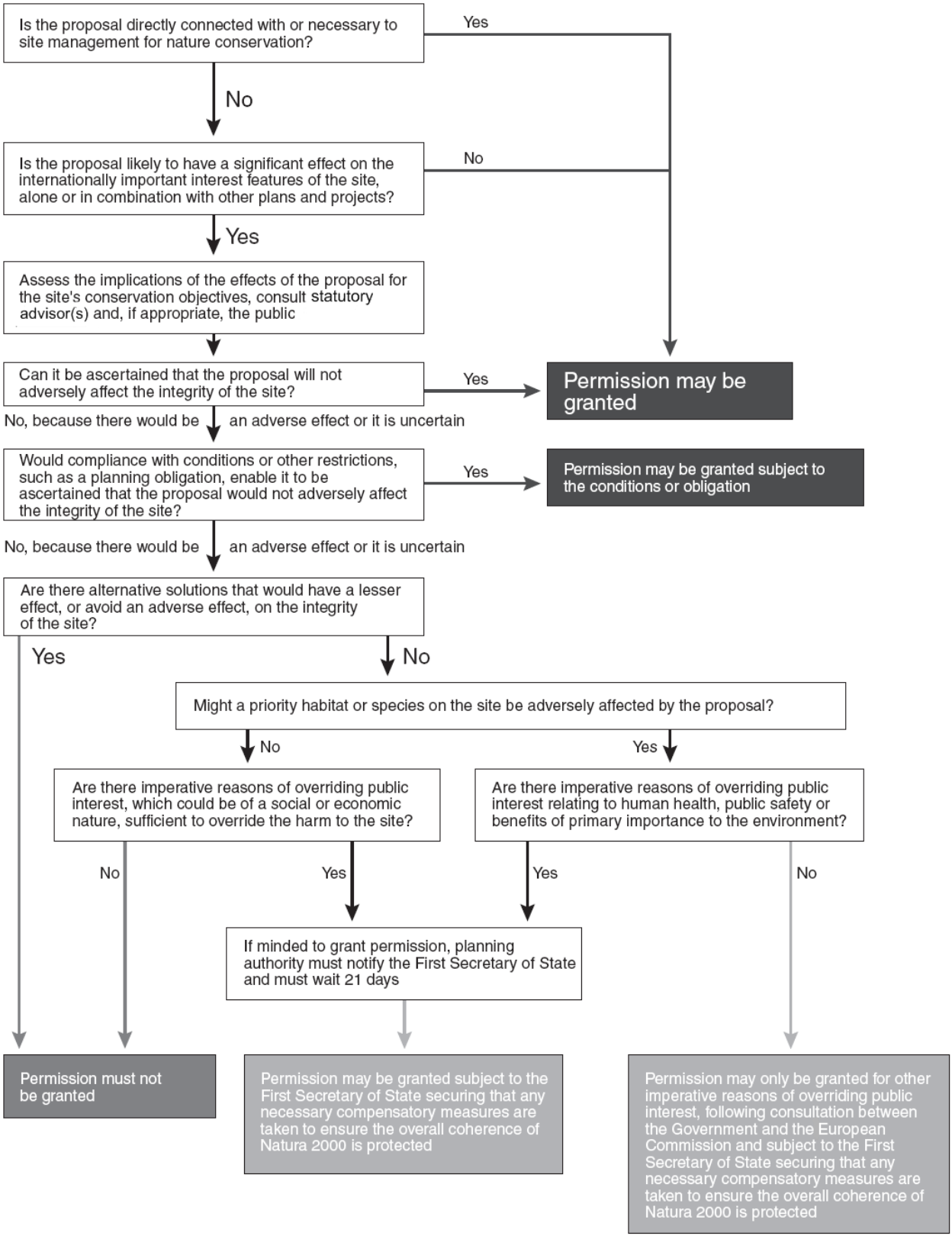
- Considered, on the basis of the precautionary principle, whether it could be concluded that the integrity of relevant sites would not be affected. This impact prediction involved a consideration of the cumulative and in-combination effects.
- Examined, in relation to elements of the plan where it was not possible to conclude that the integrity of relevant sites would not be affected, whether appropriate mitigation measures could be designed which cancelled or minimised any potential adverse effects identified.
- Considered the comments received from statutory advisers and others on the draft AA.
- Completed the AA, including DECC's conclusion on whether or not it is possible to go ahead with the plan.

In considering the above, DECC used the clarification of the tests set out in the Habitats Directive in line with the ruling of the ECJ in the *Waddenzee* case (Case C-127/02), so that:

- Prior to the grant of any licence all activities which may be carried out following the grant of such a licence, and which by themselves or in combination with other activities can affect the site's conservation objectives, are identified in the light of the best scientific knowledge in the field.
- A licence can only be granted if DECC has made certain that the activities to be carried out under such a licence will not adversely affect the integrity of that site (i.e. cause deterioration to a qualifying habitat or habitat of qualifying species, and/or undermine the conservation objectives of any given site). That is the case where no reasonable scientific doubt remains as to the absence of such effects.

A flowchart summarising the process is shown in Figure 4.1.

Figure 4.1: Summary of procedures under the Habitats Directive for consideration of plans or projects affecting Natura 2000 sites



Note: 'Statutory advisor(s)' refers to the relevant statutory Government advisor(s) on nature conservation issues. Source: After ODPM (2005).

4.2 Site integrity

Site integrity is defined in the SNH HRA guidance for plan making bodies in Scotland as: *"the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified"* (Tyldesley & Associates 2012). The integrity of the site can therefore be considered to be the structure and the functioning of its ecological systems, the features for which the site is designated (habitats and/or species) and the ability of the site to meet its conservation objectives. An adverse effect would be something that impacts the site features, either directly or indirectly, and results in disruption or harm to the ecological structure and functioning of the site and/or affects the ability of the site to meet its conservation objectives across all parts of the site (Tyldesley & Associates 2012). As clarified by Section 4.6.3 of the EC Guidance (2000), the integrity of a site relates to the site's conservation objectives. These objectives are assigned at the time of designation to ensure that the site continues, in the long-term, to make an appropriate contribution to achieving favourable conservation status (see Table 4.1) for the qualifying interest features. For example, it is possible that a plan or project will adversely affect the integrity of a site only in a visual sense or only habitat types or species other than those listed in Annex I or Annex II. In such cases, the effects do not amount to an adverse effect for purposes of Article 6(3), provided that the coherence of the network is not affected. The AA must therefore conclude whether the proposed activity will have an adverse effect on the integrity of the site, in light of its conservation objectives.

4.3 Assessment

The approach to ascertaining the absence or otherwise of adverse effects on the integrity of a relevant site is set out in Section 4.1 above. This assessment has been undertaken in accordance with the European Commission Guidance (EC 2000), and with reference to various other guidance and reports including the Habitats Regulations guidance notes (e.g. SEERAD 2000), the Scottish Planning Policy (Scottish Government 2010), Circular 06/2005 (ODPM 2005), the English Nature Research Reports, No 704 (Hoskin & Tyldesley 2006) and the Scottish Natural Heritage Habitats Regulations Appraisal of Plans, No 1739 (Tyldesley & Associates 2012).

Appendix A lists and summarises the relevant sites as defined in Section 3. Appendix B then presents the results of a re-screening exercise of these sites to identify the potential for activities that could follow the licensing of the 3 Blocks in question (see work programmes in Section 2.2) to result in a likely significant effect. Where potential effects are identified in Appendix B, more detailed information on the relevant sites including their conservation objectives is provided in Appendix C.

Detailed assessments are made in Sections 5-8 of the implications for the integrity of the relevant sites (in terms of their qualifying features and species, and the site's conservation objectives) were a licence (or licences) to be granted for the 3 West of Shetland Blocks. The assessment is based on an indication of the proposed work programme for the Blocks and likely hydrocarbon resources if present, along with the characteristics and specific environmental conditions of the relevant sites as described in the Appendices. As noted in Section 2.2, the proposed work programme is taken as the maximum of any application for the Blocks; however, on past experience, less activity actually takes place than is bid at the licence application stage. Activities which may be carried out following the grant of a licence, and which by themselves or in combination with other activities can affect the conservation objectives of relevant sites are discussed under the following broad headings:

- Physical disturbance and other effects (e.g. rig siting, marine discharges)

- Underwater noise (in particular, deep geological seismic surveys, though also rig site surveys and VSP)
- Oil spills (including all liquid phase hydrocarbons)
- In-combination effects (e.g. cumulative and synergistic and secondary/indirect effects)

Use has been made of advice prepared by the conservation agencies under the various Habitats Regulations, since this typically includes advice on operations that may cause deterioration or disturbance to relevant features or species. Advice given under Regulation 33[8] (now Regulation 35 in England and Wales[9]) includes an activities/factors matrix derived from MarLIN (www.marlin.ac.uk) where applicable. Several of the "probable" effects highlighted in the MarLIN matrices are not inevitable consequences of oil and gas exploration and production, since through the regulatory EIA and permitting processes they are mitigated by timing, siting (e.g. of rigs) or technology requirements (or a combination of one or more of these). There is a requirement that these options would also be evaluated in the environmental assessments necessary as part of activity consenting.

The Marine Evidence Group is attempting to address difficulties in assessing the impacts of marine development on European sites and species, in particular gaps in evidence which create uncertainties when undertaking HRA. A report by the group (Defra 2013) provides an overview of the key evidence gaps identified in the Habitats and Wild Birds Directives Implementation Review and progress in addressing them, as well as a set of initial recommendations covering how the evidence base can be improved and how this might be built into the decision making process, which includes improving access to marine data. The areas identified in the review as having information gaps/requiring further research include:

- Modelling of effects on population of seabirds and validating critical input parameters, e.g. population framework, collision and displacement risk
- Modelling of effects on populations of marine mammals and validating critical input parameters, e.g. population framework, displacement risk
- Impacts of marine activity (e.g. offshore wind, cabling) on the seabed and priority species
- Cumulative impacts of marine activities
- Understanding better the specific impacts of different marine sectors and how they can be avoided and the solutions more widely applied
- Understanding better the populations of mobile species at appropriate scales and the population implications of any impacts from significant infrastructure projects in English waters

Many of these gaps (e.g. collision risk) are chiefly of relevance to marine renewable energy developments, although some have applicability to oil and gas activities.

[8] The Conservation (Natural Habitats, &c.) Regulations 1994.
[9] The Conservation of Habitats and Species Regulations 2010.

The conservation objectives identified for SAC and SPA features for sites where a likely significant effect has been identified are listed in Appendix C. These objectives, in relation to the specific qualifying features of each site, and the conservation status of these features, have been considered during this AA, including a site-specific consideration of conservation objectives in relation to activities outlined in the work programmes which may arise from licensing the blocks subject to assessment. The basis and primary concern of the conservation objectives are to maintain or achieve favourable conservation status. Table 4.1 provides a definition of conservation status based on Articles 1(e) and (i) of the Habitats Directive.

Table 4.1: Definition of favourable conservation status for sites defined in the Habitats Directive

For habitats	Conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. The conservation status of a natural habitat will be taken as 'favourable' when: • its natural range and areas it covers within that range are stable or increasing • the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future • the conservation status of its typical species is favourable (see below)
For species	Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The *conservation status* will be taken as 'favourable' when: • population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and • 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 populations on a long-term basis

High level controls and mitigation measures are in place for each of the broad sources of effect listed above (see Table 4.2, Figures 2.2 and 2.3). These mitigation measures, which are discussed in more detail in Sections 5-8, should *inter alia* help to avoid the deterioration of any qualifying habitats, and habitats supporting species, and seek to prevent undermining any of the conservation objectives for a given site in relation to the features for which it is designated. These high-level mitigation measures can be partly interpreted as "...conditions or other restrictions such as a planning obligation, [compliance with which would] enable it to be ascertained that the proposal would not adversely affect the integrity of the site" (see Figure 4.1, above), though also represent other non-statutory guidance etc. with regards to the avoidance of significant effects on sites. Where it is considered conservation objectives would not be undermined by any of the given sources of effect for a particular species or habitat (e.g. due to animal behaviour and/or the location/characteristics of a particular habitat), certain sites may be screened out of the assessment, and these are listed in Appendix B.

Table 4.2: High level mitigation measures identified for potential sources of effect

	High level Mitigation
Physical disturbance	All Blocks under consideration are at least 28km offshore and remote from Natura 2000 sites.
Marine Discharges	Discharges from offshore oil and gas facilities have been subject to increasingly stringent regulatory controls over recent decades, and oil and other contaminant concentrations in the major streams (drilling wastes and produced water) have been substantially reduced or eliminated. Discharges would be considered in detail in project-specific Environmental Statements, HRAs (where necessary) and chemical risk assessments under existing permitting procedures.
Other effects	The IMO International Convention for the Control of Ballast Water and Sediment, serves to mitigate against the possible introduction of invasive alien species through shipping ballast, which may degrade sensitive local habitats and communities. Measures include the mid-ocean exchange of ballast water (with ultra-violet irradiation of ballast a proposed alternative). The potential for collision of birds with offshore infrastructure, increased by attraction of birds to lights may be mitigated by limiting well testing to the minimum time required to satisfy test objectives and limit any flaring required to that which meets the technical requirements of processing. Rescheduling of activities, for instance by avoiding or limiting activities during months when large numbers of birds aggregate in the area, could help to reduce the risk of bird collision.
Underwater noise	Application for consent to conduct seismic and other geophysical surveys – PON14 Seismic operators are required, as part of the application process, to justify that their proposed activity is not likely to cause a disturbance etc. under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) and *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended). It is a condition of consents issued under Regulation 4 of the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (& 2007 amendments) for oil and gas related seismic surveys that the JNCC, *Guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys,* are followed. European Protected Species (EPS) disturbance licences can also be issued under the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended)*. Passive acoustic monitoring (PAM) may be required as a mitigation tool. DECC will take account of the advice provided by the relevant statutory nature conservation body in determining any consent conditions. Potential disturbance of certain species may be avoided by the seasonal timing of noisy activities, and periods of seasonal concern for individual Blocks on offer have been highlighted (see Section 2.2) for which licensees should expect to affect DECCs decision whether or not to approve particular activities.
Oil Spills	Oil Pollution Emergency Plans (OPEPs): regulatory requirements on operators to prepare spill prevention and containment measures, risk assessment and contingency planning – these are reviewed by DECC, MCA, JNCC, relevant SNCB (e.g. SNH) and other relevant organisations.

High level Mitigation	
	Additional conditions imposed by DECC, through block-specific licence conditions (i.e. "Essential Elements"), and seasonal periods of concern for drilling, within which there is a presumption for drilling activity to be refused unless appropriate mitigation measures can be agreed (defined at the project level). Project level mitigation defined through permitting/HRA of specific activities (including conditions attached to consents/permits or potentially consent/permit refusal). MCA is responsible for a National Contingency Plan and maintains a contractual arrangement for provision of aerial spraying, with aircraft based at East Midlands and if necessary, Inverness and counter-pollution equipment (booms, adsorbents etc.). The UK Government announced in 2012 that an Emergency Towing Vessel for the waters around the Northern and Western Isles will be stationed in Orkney up to 2015[10]. The government has also been in discussions with the oil industry on the potential of a commercial call-out arrangement to use their vessels[11] and BP have recently agreed to volunteer a vessel to help in an emergency should the MCA deem it appropriate[12].
In-combination effects	The competent authorities will assess the potential for in-combination effects during HRA of project specific consent applications; this process will ensure that mitigation measures are put in place to ensure that subsequent to licensing, specific projects (if consented) will not result in adverse effects on integrity of European sites.

[10] Orkney Islands Council website - http://www.orkney.gov.uk/OIC-News/emergency-vessel-to-be-stationed-in-orkney.htm
[11] Scotland Office website - http://www.scotlandoffice.gov.uk/scotlandoffice/17322.html
[12] https://www.gov.uk/government/news/moore-welcomes-bp-and-north-star-support-for-second-support-vessel

5 Consideration of sites & potential physical & other effects

5.1 Introduction

Several activities associated with oil and gas exploration and production can lead to physical disturbance, damage, alteration or contamination of seabed habitats and geomorphological features, with consequent effects on benthic communities. The prime potential sources of effect are summarised below, followed by a consideration of the foreseeable effects on relevant sites assessed to be at potential risk, and whether these could adversely affect the integrity of these sites.

5.2 Physical damage at the seabed

The main sources of physical disturbance of the seabed from oil and gas exploration and appraisal activities are:

- **Anchoring of semi-submersible rigs**. Semi-submersible rigs use anchors to hold position, typically between 8 and 12 in number at a radius depending on the water depth, and cause seabed disturbance from the anchors and chain or cables, and in cohesive sediments, leave 'anchor mounds' after their retrieval.

- **Placement of jack-up rigs**. Jack-up rigs, normally used in shallower water, leave three or four depressions from the feet of the rig (the spud cans) around 15-20m in diameter. In locations with an uneven seabed, material such as grout bags may be placed on the seabed to stabilise the rig feet.

- **Drilling of wells and wellhead removal**. The surface hole sections of exploration wells are typically drilled riserless, producing a localised (and transient) pile of surface-hole cuttings around the surface conductor. After installation of the surface casing (which will result in a small quantity of excess cement returns being deposited on the seabed), the blowout preventer (BOP) is positioned on the wellhead housing. These operations (and associated activities such as ROV operations) may result in physical disturbance of the immediate vicinity (a few metres) of the wellhead. When an exploration well is abandoned, the conductor and casing are plugged with cement and cut below the mudline (sediment surface) using a mechanical cutting tool deployed from the rig and the wellhead assembly is removed. The seabed "footprint" of the well is therefore removed although post-well sediments may vary in the immediate vicinity of the well compared to the surrounding seabed. The time taken for full seabed recovery will depend on location, sediment type, and water depth.

Activities following the initial term (platform/subsea template installation and pipelay) would only take place following successful appraisal of potential hydrocarbon reserves, and would be subject to further assessment including HRA (where appropriate) at that stage.

The use of anchors by drill rigs will produce a linear scar along the trajectory from anchor placement and recovery. A larger overall surface scrape may be expected from catenary action of anchor chains or cables though this is dependent upon water depth, anchor spread and tension of the chain or cable. Anchor handling may also cause some re-suspension of sediments. The duration of physical impact on the seabed will, however, be short due to the temporary nature of anchor placement. The time taken for the recovery of the seabed is difficult to accurately determine and is dependent on severity of impact, location, sediment type, and water depth (e.g. Foden *et al.* 2009).

High energy environments are characterised by clean, coarse sandy bottoms, whereas low energy environments are characterised by muddy sediments. Benthic communities that inhabit the different sediment types have adapted to different levels of recovery based on the frequency of natural disturbance in that environment. Species typical of shallow, wave exposed sandy sediments will possess the ability to recover from disturbance at a much more rapid rate. Species that inhabit deep, muddy environments are not as well adapted to physical disturbance of their habitat and it is likely they will take a significantly longer time to recover (Dernie *et al.* 2003, Snelgrove 1999).

Environmental Statements report a typical area that will be affected by such anchor scarring as some 2.4km^2 (e.g. Iona Energy 2012), while it is estimated that areas affected by anchor scarring will recover within 1-5 years (DECC 2011). Anchoring and catenary scarring are not expected to result in significant changes to sediment properties and rapid recovery of faunal communities within the disturbed area may be expected through a combination of larval settlement and immigration of animals from the adjacent seabed. Infill of scars can, however, produce alteration of sediment type within the feature which is longer-term than the topographic expression of the scar, since the infill is usually of finer sediment (e.g. Robinson *et al*. 2005). Anchoring in areas of stiff clay can result in long lasting mounds of sediment.

DECC oil and gas SEAs have compared the physical disturbance effects of oilfield activities to those of fishing and natural events in shallow water (e.g. storm wave action), and concluded that oilfield effects are typically minor on a regional scale. It is generally accepted that the principal source of human physical disturbance of the seabed and seabed features is bottom trawl fishing (Hall-Spencer *et al*. 2002). Trawl scarring is a major cause of concern with regard to conservation of shelf and slope habitats and species (e.g. Witbaard & Klein 1993, de Groot and Lindeboom 1994, Kaiser *et al*. 2002a, Kaiser *et al*. 2002b, Gage *et al*. 2005). The long-term effects of bottom fishing disturbance is less well understood due to the complex nature of the changes and the lack of pre-impact or control data (Frid *et al.* 2000, Bradshaw *et al.* 2002). Analysis of 101 experimental fishing impact studies undertaken by Kaiser *et al.* (2006) predicted recovery times in sand and gravel habitats after a scallop trawl as *ca.* 8 years; muddy sand as *ca.* 1.6 years and reef as *ca.* 3.2 years), with the scallop trawl being particular severe in terms of benthic disturbance (Mason 1983). Beam and otter trawling of sandy and muddy sediments exhibited a quicker recovery rate of the benthic species. However, the recovery rate of muddy sand after beam and otter trawl is still predicted at *ca.* 0.6-0.65 years respectively (Kaiser *et al.* 2006).

Rock placement may be undertaken to protect against scour in areas of strong tidal currents for rig stability. The introduction of rock (as well as steel or concrete structures) into an area with a seabed of sand and/or gravel can provide “stepping stones” which might facilitate biological

colonisation including by non-indigenous species by allowing species with short lived larvae to spread to areas where previously they were effectively excluded. However, on the UK continental shelf such "stepping stones" are already widespread and numerous, as a result of for example rock outcrops, glacial dropstones and moraines, relicts of periglacial water flows, accumulations of large mollusc shells, carbonate cemented rock etc. Rig site surveys in UK waters typically reveal the presence of such natural "stepping stones". Those activities that could follow licensing of the Blocks (e.g. drilling of a well, as described by the proposed work programme) are unlikely to result in significant introduction of rock or structures to the marine environment, and are therefore unlikely to undermine the conservation objectives of SACs in the area. The nature, location and extent of any subsequent further development including the installation of steel or concrete structures and protective rock dump if necessary, is not currently known and would be more appropriately assessed through project level EIA and where relevant, HRA processes.

The broad distribution of large scale biotopes of conservation importance is relatively well understood in the region (see McBreen *et al.* 2011, Scottish Government 2011). Within the boundaries of designated and potential SACs the occurrence of habitats of interest is usually known with greater precision. The routine sources of potential physical damage are assessed and controlled by a range of regulatory processes, such as EIA and the Petroleum Offshore Notice for drilling (PON15B) and where relevant HRA's to underpin those applications. Provisions under the Marine and Coastal Access Act (2009) include certain activities such as decommissioning operations previously covered by the Food and Environment Protection Act which are now permitted through a Marine Licence. Based on the results of the assessments including HRA, DECC may require additional mitigation measures to avoid or minimise any adverse effects, or where this is not possible, refuse consent. Drilling activities outlined above require individual survey of the proposed rig location, reports from which are used to inform the technical feasibility of drilling. Additional survey work may be required, such as limited benthic survey, but this is considered on a case by case basis. Subject to the results of such surveys, the location of activities could be altered and/or additional survey work undertaken. Such reports are used to underpin operator environmental submissions (e.g. PON15B and Environmental Statements) and are typically made available to nature conservation bodies during the consultation phases of these assessments.

5.3 Marine discharges

As described in previous DECC oil and gas SEAs, marine discharges from exploration and production activities include produced water, sewage, cooling water, drainage, drilling wastes and surplus water based mud (WBM), which in turn may contain a range of hydrocarbons in dissolved and suspended droplet form, various production and utility chemicals, metal ions or salts (including Low Specific Activity radionuclides). Discharges during the exploration phase are restricted to those associated with drilling and related support activities.

Drilling wastes are a major component of the total waste streams from offshore exploration and production, with typically around 1,000 tonnes of cuttings resulting from an exploration or development well. Water-based mud cuttings are discharged at, or relatively close to sea surface during "closed drilling" (i.e. when steel casing and a riser is in place), whereas surface hole cuttings will be discharged at seabed during "open-hole" drilling. Use of oil based mud systems, for example in highly deviated sections or in water reactive shale sections, would require the onshore disposal, offshore treatment prior to discharge or reinjection of a proportion of waste material (DECC 2011).

Dispersion of mud and cuttings is influenced by various factors, including particle size distribution and density, vertical and horizontal turbulence, current flows, and water depth. In deep water, the range of cuttings particle size results in a significant variation in settling velocity, and a consequent gradient in the size distribution of settled cuttings, with coarser material close to the discharge location and finer material very widely dispersed away from the location, generally at undetectable loading (DECC 2009).

In contrast to historic oil based mud discharges, effects on seabed fauna of the discharge of cuttings drilled with WBM and of the excess and spent mud itself are usually subtle or undetectable, although the presence of drilling material at the seabed close to the drilling location (<500m) is often detectable chemically (e.g. Cranmer 1988, Neff *et al.* 1989, Hyland *et al.* 1994, Daan & Mulder 1996). Considerable data has been gathered from the North Sea and other production areas, indicating that localised physical effects are the dominant mechanism of ecological disturbance where water-based mud and cuttings are discharged (DECC 2011).

Currie & Isaacs (2005) reported that water based drilling muds and associated cuttings modified population densities of benthic infaunal species at sampling sites up to 200m from an exploration well in the Minerva field, Australia. The most pronounced effects were evident within 100m of the well-head, where declines in density of most abundant species exceeded 70% immediately following drilling. However, effects on the community structure at sites 100 and 200m from the wellhead did not persist beyond four months as natural species recruitment swamped residual effects over the same period. In contrast, benthic communities at the well-head site remained modified 11 months after drilling, in spite of recoveries in species diversity and abundance. This persistent community difference was likely due to the physical modification of the sediment at this site by drill cuttings discharge.

The physical disturbance of benthic ecosystems by water-based drill cuttings was examined in a series of mesocosm (Trannum *et al.* 2010) and field experiments (Trannum *et al.* 2011). The mesocosm experiments highlighted a potential reduction in number of taxa, abundance, biomass and diversity of macrofauna with increasing thickness of drill cuttings possibly as a result of oxygen depletion. However, comparison with the field-based experiments indicated that this was probably due to the lack of continuous water flow over the sediment surface in the mesocosm experiments (Trannum *et al.* 2011). The field experiments found that the difference in faunal composition between the controls and those treated with drill cuttings was of small magnitude 6 months after drill cuttings deposition indicating a relatively rapid recovery process following discharge of water-based drill cuttings. This corresponds with field studies where complete recovery was recorded within 1–2 years after deposition of water-based drill cuttings (Daan & Mulder 1996, Currie & Isaacs 2005).

OSPAR (2009) concluded that the discharge of drill cuttings and water-based fluids may cause some smothering in the near vicinity of the well location. The impacts from such discharges are localised and transient, but may be of concern in areas with sensitive benthic fauna, for example corals and sponges.

In addition to these mainly drilling rig-derived discharges, a range of discharges are associated with support vessels (sewage, cooling and drainage waters). Discharges from offshore oil and gas facilities have been subject to increasingly stringent regulatory controls over recent decades, and oil concentrations in the major streams (drilling wastes and produced water) have been substantially reduced or eliminated. Amendments to the Offshore Chemicals Regulations 2002 made in 2011 clarify the definition of chemical discharges to include a “discharge” as captured under the relevant operational permit, and a “release” which is any other emission of chemicals outside of that covered by the permit whether as a result of operational requirements

or accident. The effects of marine discharges are judged to be negligible in the context of proposed licensing and the Natura 2000 sites in the area and are not considered further here. Discharges are considered in detail in project-specific Environmental Statements, HRAs (where necessary) and chemical risk assessments[13] (e.g. PONs) under existing permitting procedures (see Figure 2.2).

5.4 Other effects

Through the transport and discharge of vessel ballast waters (and associated sediment), and to a lesser extent fouling organisms on vessel/rig hulls, non-native species may be introduced to the marine environment. Should these introduced species survive and form established breeding populations, they can exert a variety of negative effects on the environment. These include: displacing native species by preying on them or out-competing them for resources such as prey and habitat; irreversible genetic pollution through hybridisation with native species; increased occurrence of toxic algal blooms. The economic repercussions of these ecological effects can also be very significant. SNH non-statutory advice for the Sullom Voe SAC (SNH 2006a) indicates that the introduction of non-native species through, for example, the discharge of ballast and attachment to ships' hulls could occur within or close to the SAC. Non-natives have the potential to cause deterioration of qualifying habitats and communities through alteration of community and substrate characteristics (e.g. through stabilising former mobile areas / destabilising former stable areas) or through competing with native species (SNH 2006a). In response to these risks, a number of technical and procedural measures have been proposed (such as the use of ultraviolet radiation to treat ballast water) or introduced such as a mid-ocean exchange of ballast water (the most common mitigation against introductions of non-native species). International management of ballast waters is addressed by the International Maritime Organisation (IMO) through the International Convention for the Control and Management of Ships Ballast Water & Sediments, which was ratified in 30 States[14] in 2005. The Convention includes Regulations with specified technical standards and requirements (IMO Globallast website). Further oil and gas activity is unlikely to change the risk of the introduction of non-native species as the vessels typically operate in a geographically localised area although rigs may move between the Irish Sea to the North Sea and vice versa and the risk from hull fouling is low, given the geographical working region and scraping of hulls for regular inspection.

The potential effects of light on birds have been raised in connection with offshore oil and gas over a number of years (e.g. Wiese *et al*. 2001). As part of navigation and worker safety, oilfield installations and associated vessels are lit at night and the lights will be visible at distance (some 10-12nm in good visibility). Platform illumination has been shown to have an attractive effect on many species of migratory birds, with attraction enhanced in conditions of poor visibility such as fog, haze and drizzle (Wiese *et al*. 2001 and references therein). Responses to a recent OSPAR questionnaire seemed to indicate that the main cause of death was dehydration, starvation and exhaustion, although some birds had physical damage resulting from collisions with the infrastructure, and an even smaller number had interacted with the flare or turbine exhausts. Birds which are attracted to these light sources at night typically circle around the illuminated

[13] Note that most chemicals used offshore are regarded to Pose Little or No Risk (PLONOR) to the marine environment. Chemicals containing substances marked for substitution (as shown on OSPAR prescribed lists) are due to be phased out by 2016 where their continued use cannot be justified (e.g. due to there being no technical alternative). Offshore operators are currently required to justify the use and/or discharge of candidates for substitution each time that they submit an application for a chemical permit (e.g. PON15B) – see Figure 2.2.
[14] Number of states required to ratify the Convention for it to come into force.

platform for extended periods of time (sometimes many hours) and it has been suggested that the circling increases the risk of collision leading to traumas and deaths (OSPAR 2012). It was concluded that there was evidence that conventional lighting of human-made offshore structures had an impact on birds, but it could not be concluded that the effect was significant at the population level (OSPAR 2012).

The temporary nature of drilling activities means that a drilling rig will be present for a relatively short period of time minimising the potential for significant interaction with migratory bird populations. It is also unlikely that drilling rigs will be located so close to shore as to illuminate coastal habitats and affect the foraging behaviour of waders and waterfowl (e.g. Dwyer *et al.* 2012). It is therefore concluded that light effects will not affect site integrity, nor undermine the conservation objectives of sites with qualifying mobile species which could potentially interact with illuminated platforms and vessels.

As described in Section 7.3.3.1, the west of Shetland area including the Blocks may support important numbers of seabirds at certain times of the year including breeding great skua (May-August) and breeding puffin (April-June). These birds may be associated with coastal breeding sites on Shetland including Hermaness, Saxa Vord and Valla Field SPA and Foula SPA, both of which include the species as qualifying features. Therefore, the presence and/or movement of vessels from and within any of the Blocks during drilling activities could potentially disturb foraging seabirds outside SPA site boundaries. However, given the projected limited scale and nature of the activities, and because mitigation is possible (which would be identified during activity specific assessment and permitting processes), adverse effects on the integrity of sites are not expected.

Physical disturbance of seaduck and other waterbird flocks by vessel and aircraft traffic associated with oil and gas exploration and production are possible, particularly in SPAs established for shy species such as common scoter. Such disturbance can result in repeated disruption of bird feeding, loafing and roosting. It is considered this source of potential effect will not result in significant disturbance to the species within Natura 2000 sites or threaten the viability of populations of qualifying features at the sites because of the location of the SPAs relative to the Blocks applied for, and because mitigation is possible which would be identified during activity specific assessment and permitting processes. Available mitigation measures include strict use of existing shipping and aircraft routes, timing controls on temporary activities to avoid sensitive periods. Oil and gas developments also tend to be primarily subsea infrastructure based, and therefore any disturbance at the sea surface is reduced to periods of construction and decommissioning only, with the likelihood of significant disturbance to species further reduced as a result. It is therefore concluded that adverse effects on the integrity of sites from physical disturbance are not expected.

Since 2008, a number of dead seals (>76 animals) displaying corkscrew injuries (Bexton *et al.* 2012) have been found primarily on beaches in eastern Scotland, North Norfolk coast and Strangford Lough (Thompson *et al.* 2010). The injuries are consistent with those that might be expected if the seals had been drawn through a ducted propeller or some types of Azimuth thruster (widely used in marine industry vessels), although there is presently no definitive evidence to confirm this (SNCB 2012).

A SMRU research project is underway and in the interim, advice by the statutory nature conservation bodies (SNCB) sets out recommendations for regulators and industry with regards to understanding and minimising the risk of corkscrew injury to seals (SNCB 2012). There are no relevant SACs for seals within the distances advised (30nm for harbour seal SACs and 4nm for grey seal SACs, SNCB 2012) from the West of Shetland Blocks. Given the temporary nature

of the drilling and support activities that could follow licensing and the distance of the Blocks from relevant SACs, adverse effects on the integrity of sites are not expected.

It is indicated in the seal density maps presented in Figure 6.1 that the west of Shetland area is important for seals. For both grey and harbour seals, coastal waters close to haul out sites on Shetland and Orkney support moderate to very high densities of seals. Moderate to low densities are found further offshore in the area of the Blocks. Therefore, the presence and/or movement of vessels from and within any of the Blocks during drilling activities could potentially disturb foraging seals within or close to the Blocks. However, given the distance of the Blocks from relevant SACs, the low number of individual seals likely to be present over the Blocks at any one time, and the limited temporal and spatial footprint of potential activities, no adverse effect on site integrity associated with the presence and/or movement of vessels from and within any of the Blocks is predicted.

Oil and gas development that could follow on from the exploration activities outlined in the Block work programmes could include platform installation, though oil and gas developments are increasingly based on subsea infrastructure and therefore any disturbance at the sea surface is reduced to periods of construction and decommissioning. The likelihood of significant disturbance to species is further reduced as a result. Development level activities involving oil production and processing may be subject to EIA and require permitting for individual activities including drilling, pipelay, and discharges, and project level HRA will also be undertaken where appropriate. It is therefore concluded that adverse effects on the integrity of sites from physical disturbance are not expected.

5.5 Implications for relevant sites

The re-screening process (Appendix B) did not identify the potential for physical damage and marine discharge effects at any relevant Natura 2000 sites. Additionally, all potentially damaging activities that could follow licensing of Blocks 206/9b, 206/10b and 206/14 would be subject to risk assessment, mitigation and permitting measures, which may include assessment of the potential effects on the integrity of Natura 2000 sites. Risks to overall site integrity from subsequent development activities (e.g. pipelaying) would be prevented by the existing legal framework for the respective activities, which includes EIA and HRA (where necessary).

5.6 Conclusions

All Blocks under consideration in the West of Shetland area are at least 28km offshore and remote from Natura 2000 sites. Likely significant effects with regards to physical effects on the seabed, marine discharges and other disturbance effects (e.g. lighting, vessel and aircraft traffic), when aligned with project level mitigation and relevant activity permitting, will not have an adverse effect on the integrity of the Natura 2000 sites considered in this assessment. There is a legal framework, via e.g. EIA regulations and those implementing the Habitats Directive, to ensure that there are no adverse effects on the integrity of Natura 2000 sites. These would be applied at the project level, at which point there will be sufficient definition to make an assessment of likely significant effects, and for applicants to propose project specific mitigation measures.

Taking into account the information presented above and in the Appendices, it is concluded that with mitigation, activities arising from the licensing of Blocks 206/9b, 206/10b and 206/14 will not cause an adverse effect on the integrity of relevant sites, though consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of a well and any related activity including the placement of a mobile rig, will not have an adverse effect on the integrity of relevant sites.

6 Consideration of sites and potential acoustic effects

6.1 Overview of effects of acoustic disturbance

Of all marine organisms, marine mammals are regarded as the most sensitive to acoustic disturbance. This is due to their use of acoustics for echolocation and vocal communication and their possession of lungs which are sensitive to rapid pressure changes. Most concern in relation to seismic noise disturbance has been related to cetacean species. However, some pinnipeds are known to vocalise at low frequencies (100-300Hz) (Richardson *et al*. 1995), suggesting that they have good low frequency hearing and are therefore sensitive to acoustic disturbance. Otters in coastal habitats may also experience acoustic disturbance from seismic exploration or piling. However, they generally occupy shallow, inshore areas where the propagation of seismic noise is very limited.

Marine Scotland identified a period of concern for seismic activity for Block 206/14 because of potential adverse effects on fish spawning (see Table 2.2) and it is envisaged that consent would not be granted for seismic survey during this period. Many species of fish are highly sensitive to sound and vibration (review in MMS 2004). Exposure to high sound pressure levels has been shown to cause long-term (>2 months) damage to sensory cells in fish ears (Hastings *et al*. 1996, McCauley *et al*. 2003). Other reported effects include threshold shifts (hearing loss), stress responses and other behaviour alterations (review in Popper *et al*. 2003). A number of field studies have observed displacement of fish and reduced catch rates, suggested to be attributable to behavioural responses to seismic exploration (e.g. Skalski *et al*. 1992, Engås *et al*. 1996, Hassel *et al*. 2004, Slotte *et al*. 2004). Relevant sites in the region include several designated for the presence of the Annex II species Atlantic salmon (e.g. a number of Riverine SACs including the Rivers Thurso and Borgie).

Atlantic salmon *Salmo salar* have been shown through physiological studies to respond to low frequency sounds (below 380Hz), with best hearing (threshold 95 dB re 1 µPa) at 160Hz. Hence, their ability to respond to sound pressure is regarded as relatively poor with a narrow frequency span, a limited ability to discriminate between sounds, and a low overall sensitivity (Hawkins & Johnstone 1978, cited by Gill & Bartlett 2010). There is, however, evidence that juvenile *S. salar* smolts (as well as other salmonid species) are sensitive to very low frequency sound. Knudsen *et al*. (1994) showed that a source of intense low frequency sound (10Hz) within a river acted as an acoustic barrier to young salmon, with fish being displaced to an area where the intense sound was absent. Furthermore, numerous fish species present in the region provide important components of the diet of qualifying species of other relevant sites, such as harbour seal *Phoca vitulina* (Yell Sound Coast SAC, Sanday SAC), grey seal *Halichoerus grypus* (Faray and Holm of Faray SAC) and several seabird species such as guillemot, herring gull, razorbill (e.g. Foula SPA, Noss SPA, Fair Isle SPA).

There are currently no UK Natura 2000 sites with mobile marine invertebrates as qualifying features. However, invertebrates such as squid may form an important component of the diet of qualifying Annex II species, for example harbour seal. The study of effects of seismic noise on invertebrates is limited, and it has been suggested that no reliable conclusions can be made that negative effects exist or not (Moriyasu *et al.* 2004). Recent studies into the effects of seismic exploration on crustaceans have shown no significant long term effects on physiology, behaviour or catch rates (Christian *et al*. 2003, DFO 2004, Parry & Gason 2006). Due to their well developed nervous system, cephalopods such as squid may be more sensitive to seismic noise than other invertebrates; however, evidence for effects of seismic noise on them is very limited (review in Moriyasu *et al*. 2004). Andre *et al*. (2011) indicated that controlled exposure of four cephalopod species to low-frequency sounds resulted in permanent and substantial alterations of the sensory hair cells of the statocysts, the structures responsible for the animals' sense of balance and position.

Direct effects on seabirds because of seismic exploration noise could occur through physical damage, or through disturbance of normal behaviour. Diving seabirds (e.g. auks) may be most at risk of acute trauma. The physical vulnerability of seabirds to sound pressure is unknown, although McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic in some species (e.g. penguins, considered as a possible proxy for auk species) would be high, hence only at short ranges would individuals be adversely affected. Mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere. A study has investigated seabird abundance in Hudson Strait (Atlantic seaboard of Canada) during seismic surveys over three years (Stemp 1985). Comparing periods of shooting and non-shooting, no significant difference was observed in abundance of fulmar, kittiwake and thick-billed murre (Brünnich's guillemot). Impact on prey species (e.g. fish) could undermine conservation objectives for sites, for instance this may represent an indirect disturbance to qualifying species, or a temporary deterioration of the functioning of the habitats which support qualifying species, though mitigation measures are available (see Section 6.5) the implementation of which will also be assessed in detail once project plans are available.

Airborne noise, for example from helicopter overflights, could potentially disturb birds in coastal SPAs, although in the context of other military and civilian aircraft activities the anticipated level of Block activity related noise is insignificant. In specific cases of concern, including seasonal concerns (for instance, during moulting), mitigation through routeing restrictions could be implemented, and these will be considered at a project specific level.

6.2 Noise sources and propagation

Compared to the noise derived from seismic surveys and piling, noise from other oil and gas activities is relatively minor; previous DECC SEAs have assessed noise in some detail (e.g. Section 5.3 of OESEA2 Environmental Report (DECC 2011), and the following discussion is focussed on seismic noise as the primary concern. The potential for significant effect is therefore largely related to the anticipated type, extent and duration of seismic survey associated with proposed licensing (a 3D seismic survey is proposed for the West of Shetland Blocks although source size and area has not yet been defined). The range over which noise propagates (and effects may result) varies with water depth, density stratification, substrate and other factors, and is therefore area-specific.

6.2.1 Seismic survey

With the exception of explosives and modern military sonar (and possibly wind farm monopile piling), airgun arrays used for seismic surveys are the highest energy man made sound sources in the sea; broadband peak-to-peak (p-p) source levels of 248-259dB re 1µPa are typical of

large arrays (Richardson *et al*. 1995). Airgun noise is impulsive (i.e. non-continuous), with a typical duty cycle of 0.3% (i.e. one 25ms pulse every 10s) and slow rise time (in comparison to explosive noise). These characteristics complicate both the measurement of seismic noise "dose" and the assessment of biological effects (many of which have been studied in relation to continuous noise). Most of the energy produced by airguns is below 200Hz, although some high frequency noise may also be emitted (Goold 1996). Peak frequencies of seismic arrays are generally around 100Hz; source levels at higher frequencies are low relative to that at the peak frequency but are still loud in absolute terms and relative to background levels.

The offshore energy SEA process has reviewed general aspects of noise propagation. Most environmental assessments of noise disturbance in deeper water use simple spherical propagation models to predict sound pressure levels at varying distances from source. However, additional signal modification and attenuation may result from a combination of reflection from sub-surface geological boundaries, sub-surface transmission loss due to frictional dissipation and heat; and scattering within the water column and sub-surface due to reflection, refraction and diffraction in the propagating medium. In shallow water, reflection of high frequency signals from the seabed results in approximately cylindrical propagation and therefore higher received spectrum levels than for spherically propagated low frequency signals (which penetrate the seabed).

In general, as distance from the source increases, higher frequencies are attenuated more rapidly and beyond a few kilometres, the main contribution is in the 2kHz region. Finally beyond around 12km it will be the main low-frequency pulse of around 250Hz that has the main contribution. However, local propagation effects may have significant influence: for example frequency dependence due to destructive interference also forms an important part of the weakening of a noise signal. Simple models of geometric transmission loss may therefore be unreliable in relatively shallow water; in areas of complex seabed topography and acoustic reflectivity; where vertical density stratification is present in deep water; and where the noise does not originate from a point source. In the St George's Channel, Goold & Fish (1998) recorded 8kHz sounds above background levels at a range of 8km from the source, even in a high noise environment.

6.2.2 Other activities

Available measurements indicate that drilling activities produce mainly low-frequency continuous noise from several separate sources on the drilling unit (Richardson *et al*. 1995, Lawson *et al*. 2001). The primary sources of noise are various types of rotating machinery, with noise transmitted from a semi-submersible rig to the water column through submerged parts of the drilling unit hull, risers and mooring cables, and (to a much smaller extent) across the air-water interface. Noise transmission from jack-up drilling units used in shallower water is less because of reduced surface area contact between the water column and submerged parts of the drilling unit. Under some circumstances, cavitation of thruster propellers is a further appreciable noise source, as may be the use of explosive cutting methods (e.g. for conductor removal).

Measured farfield sound pressure of around 170dB re 1µPa, in the frequency range 10-2,000Hz (Davis *et al.* 1991) is probably typical of drilling from a semi-submersible rig and is of the same order and dominant frequency range as that from large merchant vessels (e.g. McCauley 1994). Drilling noise has also been monitored west of Shetland, in the vicinity of the Foinaven and Schiehallion developments (Swift & Thompson 2000). High and variable levels of noise were initially believed to result from drilling related activity on two semi-submersible rigs operating in the area. However, subsequent analysis found more direct correlation between the use of thrusters and anchor handlers, during rig moves, and high levels of noise (Swift & Thompson

2000). Further measurements of drilling and pipelay noise in the North Sea have been undertaken (Nedwell & Needham 2001, Nedwell *et al*. 2001, Nedwell *et al*. 2002). Drilling duration may range from a few weeks for an exploration well, to years in the case of a large development programme.

A further source of noise associated with all stages of the offshore oil industry is helicopter overflights. There is relatively little quantitative information on the transmission of helicopter airborne noise to the marine environment (Richardson *et al*. 1995). Measurements of an airsea rescue helicopter over the Shannon estuary (Berrow *et al*. 2002) indicated that due to the large impedance mismatch when sound travels from air to water, the penetration of airborne sound energy from the rotor blades was largely reflected from the surface of the water with only a small fraction of the sound energy coupled into the water.

6.3 Effects thresholds

Richardson *et al.* (1995) defined a series of zones of noise influence on marine mammals, which have been generally adopted by SEAs and EIAs undertaken in relation to previous Licensing Rounds. Similarly, data on marine mammal responses have been exhaustively reviewed (e.g. Richardson *et al*. 1995, Gordon *et al*. 1998, Lawson *et al*. 2001, Simmonds *et al*. 2003, Nowacek *et al*. 2007, Weilgart 2007, Southall *et al*. 2007). Four zones are recognised which will generally occur at increasing sound level: (1) the zone of audibility; (2) zone of responsiveness; (3) zone of masking; (4) zone of hearing loss, discomfort or injury. Potential acute effects include physical damage, noise-induced hearing loss (temporary and permanent threshold shifts, TTS and PTS respectively) and short-term behavioural responses. Postulated chronic effects (for which evidence is almost entirely absent) include long term behavioural responses, exclusion, and indirect effects. The most likely physical/physiological effects are generally considered to be shifts in hearing thresholds and auditory damage.

There is now a reasonable body of evidence to quantify noise levels associated with both seismic survey and pile-driving, and to understand the likely propagation of such noise within the marine environment. There is less clarity about the potential effects on marine mammals (and other receptors including fish), particularly in relation to distinguishing a significant behavioural response from an insignificant, momentary alteration in behaviour. Consequently, recent expert assessments have recommended that onset of significant behavioural disturbance resulting from a single pulse is taken to occur at the lowest level of noise exposure that has a measurable transient effect on hearing. A similar approach can be taken to multi-pulsed sounds although the evidence base is small and contradictory.

Behavioural responses to anthropogenic noise have generally been studied by visual or acoustic monitoring of abundance. Visual monitoring of cetaceans during seismic surveys has been carried out for several years throughout the UKCS. Statistical analysis of 1,652 sightings during 201 seismic surveys, representing 44,451 hours of observational effort, was reported by Stone (2003) and Stone & Tasker (2006). Sighting rates of white-sided dolphins, white-beaked dolphins, *Lagenorhynchus* spp., all small odontocetes combined and all cetaceans combined were found to be significantly lower during periods of shooting on surveys with large airgun arrays. In general, small odontocetes showed the strongest avoidance response to seismic activity, with baleen whales and killer whales showing some localised avoidance, pilot whales showing few effects and sperm whales showing no observed effects.

Both harbour and grey seals have shown short-term avoidance behaviour during controlled exposure experiments with small airguns (Thompson *et al*. 1998). In both cases seals abandoned foraging sites and swam away from airguns but returned to forage in the same areas

on subsequent days. By contrast, Harris *et al.* (2001) making observations from a seismic vessel operating in a shallow lagoon system in the Canadian Arctic, found no significant change in sightings rate between firing and non firing periods. Mean radial distance to sightings did increase, suggesting some local avoidance behaviour (Hammond *et al.* 2006).

6.3.1 Injury and behavioural criteria

The Offshore Energy SEAs (DECC 2009, 2011) reviewed recent data and recommendations for injury and behavioural criteria for noise assessment in marine mammals, although with emphasis on pulse noise from high-energy deep geological seismic survey and pile-driving. The OESEA utilised injury criteria proposed by Southall *et al*. (2007) composed both of unweighted peak pressures and M-weighted sound exposure levels which are an expression for the total energy of a sound wave. The M-weighted function also takes the known or derived species-specific audiogram into account. For three functional hearing categories of cetaceans, proposed injury criteria are an unweighted 230dB re 1µPa p-p for all types of sounds and an M-weighted sound exposure level of 198 or 215dB re 1 $\mu Pa^2 \cdot s$ for pulsed and non-pulsed sounds respectively. For pinnipeds, the respective criteria are 218dB 1µPa p-p for all types of sound and 186 (pulsed) or 203 (non-pulse) dB re 1 $\mu Pa^2 \cdot s$ (M-weighted). These proposals are based on the level at which a single exposure is estimated to cause onset of permanent hearing loss (PTS), by extrapolating from available data for TTS.

Southall *et al*. (2007) concluded that developing behavioural criteria was challenging, in part due to the difficulty in distinguishing a significant behavioural response from an insignificant, momentary alteration in behaviour. Consequently, they recommended that onset of significant behavioural disturbance resulting from a single pulse is taken to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (i.e. TTS-onset). These criteria for single pulses are an unweighted 224dB re 1µPa p-p and an M-weighted sound exposure level of 183dB re 1 $\mu Pa^2 \cdot s$ for three functional hearing categories of cetaceans, and 212dB re 1µPa (p-p) and 171dB re 1 $\mu Pa^2 \cdot s$ (M-weighted) for pinnipeds.

For multiple pulse and non-pulse (i.e. continuous) sources, Southall *et al*. (2007) were unable to derive explicit and broadly applicable numerical threshold values for delineating behavioural disturbance, and suggested that a context-based approach to deriving noise exposure criteria for behavioural responses will be necessary.

Based on the criteria developed by Southall *et al*. (2007), and the data reported by Lucke *et al*. (2009), indicative spatial ranges of injury and disturbance for cetaceans and pinnipeds may be calculated as indicated in Table 6.1 below. Calculated ranges for the Southall *et al*. (2007) criteria suggest that there is negligible risk of auditory damage to cetaceans, and a low to moderate risk of seals being within the required range (63m assuming modified cylindrical spreading) of seismic operations. Modified cylindrical spreading is usually considered to occur in water depths <1.5x range, i.e. spherical spreading (20logR) will occur to a range of 60m in a water depth of 40m.

From Table 6.1, the ranges affected by potential auditory injury resulting from modelled seismic survey, represent a small proportion of the marine areas used by seals (and cetaceans) associated with relevant sites in the region. Larger proportions of the overall ranges may be affected by noise levels possibly associated with behavioural modification, although the ecological significance of such postulated effects have not been demonstrated. It is acknowledged here that injury and disturbance do not necessarily lead to an adverse impact on the integrity of a relevant site under the Habitats Directive, and indeed disturbance licences can

be granted for certain levels of activity, without site integrity being compromised. Therefore, disturbance effects are not expected to have consequent effects on site integrity.

Table 6.1: Indicative spatial ranges of various injury and disturbance indicators for cetaceans and pinnipeds

	Cetaceans seismic	**Pinnipeds** seismic
Nominal vertical source level (dB p-p)	260	260
Horizontal array correction	-15	-15
Effective horizontal source level	245	245
Injury sound pressure level (multiple pulses; dB p-p)	230	218
Required propagation loss	15	27
Deep water (20logR) distance (m)	**5.6**	**22.4**
Shallow water (15logR) distance (m)	**10.0**	**63.1**
Behavioural response sound pressure level (single pulse; dB p-p)	224	212
Required propagation loss	21	33
Deep water (20logR) distance (m)	**11.2**	**44.7**
Shallow water (15logR) distance (m)	**25.1**	**158.5**
MTTS[15] (4kHz) response sound pressure level in porpoise (single pulse; dB p-p)	200	
Required propagation loss	45.3	
Deep water (20logR) distance (m)	**184**	
Shallow water (15logR) distance (km)	**1.05**	

Source: Southall et al. (2007), Lucke et al. (2009)

Popper *et al*. (2006) suggested interim criteria for injury of fish exposed to pile driving operations, although note that the majority of the evidence base for such criteria is derived from studies of seismic and explosive noise sources. A peak sound pressure level of 208dB re 1µPa for single pulses is proposed. This is supported by the findings of Popper *et al*. (2005) who showed that TTS onset (physiological fatigue and not damage) in three species of fish exposed to seismic air-gun pulses occurred within the range of 205-210dB re 1 µPa (p-p). Popper *et al*. (2006) considered available data as too sparse to set clear-cut science-based criteria for behavioural disturbance of fish or auditory masking from pile driving.

6.4 Implications for relevant sites

As discussed above, it is considered that marine mammals and migratory fish are the only qualifying species which may potentially be affected (in terms of conservation status) by acoustic disturbance. It is noted that effects on fish which are also prey species (e.g. for marine

[15] Lucke *et al.* (2007) noted that the study harbour porpoise had an elevated hearing threshold compared to published audiograms which may have been due to auditory masking in the relatively noisy test environments or electrical "masking" in their equipment. They suggested therefore that the measured effects should be considered masked temporary threshold shifts (MTTS). MTTS is detected at higher exposure levels than TTS.

mammals and birds), and may therefore result in the undermining of conservation objectives of qualifying species, are unlikely from noise sources associated with oil and gas activities, with noise levels suggested to cause injury to fish not extending beyond a few tens of metres around the noise source. Where necessary, HRA procedures will allow further consideration of the nature, timing and location of any planned activities and mitigation measures (see Section 6.5) deemed necessary to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). The re-screening process (Appendix B) identified the potential for acoustic disturbance in the following sites:

6.4.1 Special Areas of Conservation

6.4.1.1 Yell Sound Coast SAC

(Annex II species: harbour seal *Phoca vitulina,* otter *Lutra lutra*)

Yell Sound is one of the major channels in the Shetland Islands, dividing mainland Shetland from Yell. Yell Sound trends more or less north to southeast, and is open to the Atlantic in the north-west and the North Sea in the south-east. It has a rocky coastline with numerous small islands and there are several voes on both shores of the sound.

Yell Sound Coast European marine site supports over 300 harbour seals, which is more than 1% of the UK population. Their condition has been assessed as unfavourable declining. The uninhabited islands and reefs within Yell Sound supports one of the largest groups of harbour seals in Shetland and one of the most northerly groups in the UK. The seals use the offshore islands for hauling out, moulting and pupping. Further attributes of the site include ease of access to the breeding, pupping, moulting and haul-out sites and availability of undisturbed shores and adjacent areas of sea to facilitate adult social interactions, mating and to act as a nursery area (SNH 2006a).

Estimates of harbour seals in Shetland between 2007 and 2011 (3,039 seals) were 38% lower than in 2001 (4,883), though not significantly different to counts in 2006 which may suggest that the decline is slowing (SCOS 2012). In 2008 the Special Committee on Seals (SCOS) recommended that a survey of the harbour seal population of Shetland be given a high priority. In response, SMRU, with funding support from NERC, Scottish Government Marine Directorate, Scottish Natural Heritage and Natural England, established a research programme which included thermal image surveys of harbour seal moulting populations in Shetland (SCOS 2012).

The SAC also supports approximately 180 otters at higher densities than found anywhere else in Britain. This is thought to represent at least a fifth of Shetland's otters and is over 2.5% of the entire UK population. Yell Sound Coast European marine site contains the natural features essential for a thriving otter population – a low rocky coastline with shallow offshore waters for feeding, areas of peaty moorland for excavating holts, numerous freshwater areas enabling the animals to maintain their coats and availability of suitable marine habitats that support otter prey species (SNH 2006a). Their condition has been assessed as unfavourable declining.

6.4.1.2 Mousa SAC

(Annex II species: harbour seal *Phoca vitulina*)

The exposed rocky island of Mousa, on the east coast of Shetland, consistently supports a nationally important breeding colony of the harbour seal *Phoca vitulina* (around 400 adults). Their condition has been assessed as unfavourable declining. The near-shore habitats, particularly shallow bedrock reefs, are important nursery areas for the seals. Attributes of the

harbour seal habitat are the availability and ease of access to suitable and undisturbed breeding, pupping, moulting and haul-out areas on the island. Also, the availability of undisturbed shores and adjacent areas of sea facilitate adult social interactions and mating, whilst also acting as a nursery area. The large rocky tidal pools on the island are of particular importance, as they are frequently used by the seals for shelter from the exposed conditions on the open coast. Harbour seals are opportunistic foragers, feeding on locally and seasonally abundant prey in fairly shallow depths usually less than 100m.

6.4.1.3 Sanday SAC

(Annex II species: harbour seal *Phoca vitulina*)

Sanday, situated in the northeast part of Orkney, supports the largest group of harbour seal at any discrete site in Scotland, representing over 4% of the UK population. Their condition has been assessed as unfavourable declining. Derived from aerial surveys of breeding colonies, the minimum number[16] of harbour seals on Orkney as a whole in 2010 was estimated as 2,700[17] (SCOS 2012). While a high degree of uncertainty surrounds any apparent population trends, SCOS (2011) describe the harbour seal population of Orkney as possibly declining. This relates to declines in minimum estimates of harbour seals on Orkney from 7,752 in 2001 and 4,256 in 2006. Large declines have also been observed in Shetland over the same period, though 2010 population estimates were not significantly different to counts in 2006, which may suggest that the decline is slowing (SCOS 2012). A targeted research programme has been established including increased monitoring to confirm the magnitude and geographical extent of the declines (SCOS 2012).

6.4.1.4 Faray and Holm of Faray SAC

(Annex II species: grey seal *Halichoerus grypus*)

The islands, located in the northern part of Orkney, support the third-largest breeding colony in the UK, contributing around 6% of annual UK pup production in 2008 (SMRU 2011). Their condition has been assessed as favourable maintained. Derived from aerial surveys of breeding colonies, grey seal pup production for Orkney as a whole in 2010 was estimated as 20,312, representing an increase over 2009 (+6.1%); the average annual change in pup production for Orkney over the period 2003-2008 is +0.12% (SCOS 2009, SCOS 2012).

Models of grey seal habitat preference supported by satellite telemetry data suggest that foraging movements are on two geographical scales: long and distant trips from one haul-out site to another; and local repeated trips to discrete offshore areas. Foraging destinations at sea are typically localised areas characterised by gravel/sand seabed sediment, the preferred burrowing habitat of sandeels, an important component of grey seal diet. Grey seals forage widely around Orkney, with the greatest densities of animals observed in the Pentland Firth and waters immediately to the east (Matthiopoulos *et al*. 2004, SMRU 2011).

6.4.1.5 North Rona SAC

(Annex II species: grey seal *Halichoerus grypus*)

[16] Numbers are counts of hauled-out seals from aerial surveys and provide a minimum population estimate, likely to represent approximately 60-70% of the total population.
[17] Figure rounded to nearest 100.

North Rona is a remote and exposed island situated off the north-west tip of mainland Scotland. The island supports a significant breeding colony of grey seals, contributing approximately 2% of the 2008 UK pup production, though the number of pups born on the island has been gradually declining over the past 10-15 years (SMRU 2011). Their condition has been assessed as favourable maintained.

Seal tracking provides information on the foraging movements of both harbour (e.g. as reported in Sharples *et al*. 2005, 2008, 2012) and grey seals (e.g. Matthiopoulos *et al.* 2004, SCOS 2012, SMRU 2011) in the region.

The harbour seal studies indicate high site fidelity to haul-out sites, but ranging over substantial distances at sea. A total of 30 harbour seals were tagged in Orkney and Shetland between October 2003 and March 2004, and of those, 15 harbour seals (7 females, 8 males) captured in Yell Sound in the north and on the southeast coast of Shetland, animals captured in the north remained largely within the confines of Yell Sound with some further ranging movements, primarily in and around northern Shetland. Three of the animals tracked made trips of more than 100km from haul-outs. Animals tagged in the southeast of Shetland made repeated trips within 50km from the haul-out, primarily to the south and east of Shetland (Sharples *et al.* 2008). Harbour seals forage widely around Orkney, with the greatest densities of animals observed in waters around the northern islands and in several discrete areas to the east (Sharples *et al*. 2008). Of the 15 seals tagged in Orkney, foraging was largely contained within 30-40km from haul-out sites, though one female repeatedly travelled between Orkney and Shetland, covering a distance of 220km in each direction, and one male travelled between Orkney and mainland, a distance of 75km, hauling out at both locations (Sharples *et al.* 2008, 2012).

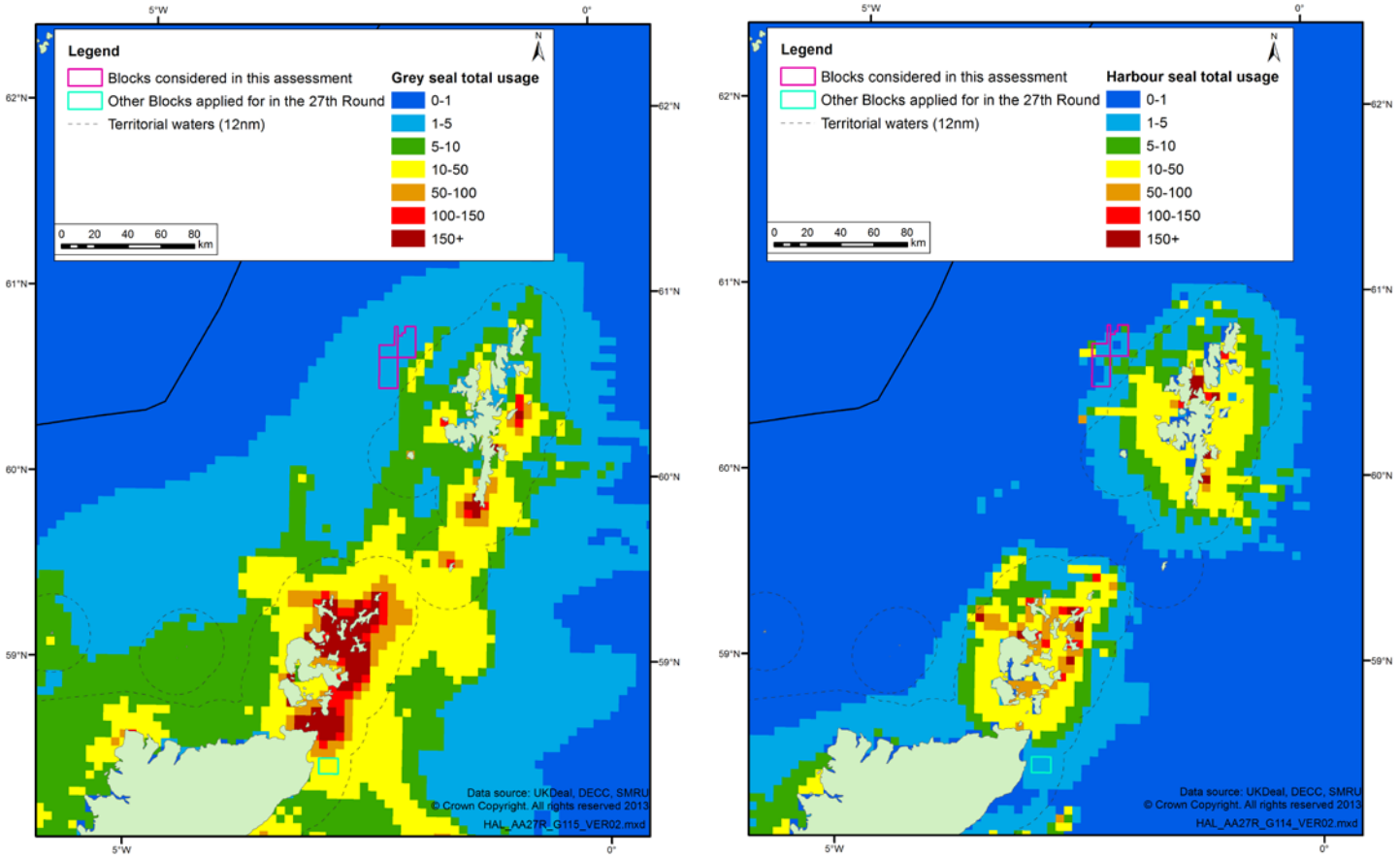
Tagging studies show grey seals to utilise much of the coastal waters along with a considerable proportion of the adjacent offshore areas. Models of marine usage show activity throughout most shelf seas of the area considered in this AA, with greatest activity around Orkney, Shetland, North Rona, the north mainland and west and south of the Outer Hebrides; activity in these areas represents some of the highest in UK waters (Matthiopoulos *et al.* 2004, SMRU 2011). Over 90% of the UK population of grey seals (see Lonergan *et al.* 2011 for UK estimates) breeds in Scotland, with Orkney having a notable colony which is also a European site (Faray and Holm of Faray SAC, see above). A tagging study of the only other site considered in this AA for the grey seal feature (North Rona) was undertaken in 2003, and involved the tagging of 17 post-breeding females. The resulting tracks indicated rapid dispersal from the site, with most seals travelling to the east and hauling out at Sule Skerry, though tracks also reached the Outer Hebrides, Orkney, Shetland and the Scottish mainland (see SMRU 2011).

Modelling of regional grey seal population estimates (Lonergan *et al.* 2011), pup production estimates (Duck & Mackey 2008, Duck 2009), and telemetry data of individual breeding females, has highlighted seasonal differences in the regional movements of breeding female grey seals between the foraging and breeding (September to December) season (Russell *et al.* 2013). For example, it was estimated from the model that up to half of the females breeding in Northern Scotland (an area including the Moray Firth, Orkney and Shetland) foraged in the East Coast region (an area between Fraserburgh and Northumberland) prior to and post breeding. Specifically, between 9 and 49% of the females that bred on Faray and Holm of Faray SAC foraged within the East Coast region.

Maps showing the at-sea distribution of grey and harbour seals around the UK have been produced (Marine Scotland website[18]). The density maps (Figure 6.1) indicate that the West of Shetland area is important for seals. For both species, coastal waters close to haul out sites on Shetland and Orkney support moderate to very high densities of seals. Moderate to low densities are found further offshore in the area of the Blocks.

Figure 6.1: Estimated total density of seals in the West of Shetland area

a) Grey seals **b) Harbour seals**



Source: Marine Scotland website

6.4.1.6 Consideration

Simple calculations of sound propagation[19] can be made to estimate the likely maximum received sound levels at the boundaries of relevant sites should a typical 3D seismic survey

[18] http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/seal-density

[19] Most environmental assessments of noise disturbance use simple spherical propagation models of the form SPL = SL – 20log(R), where SL = source level, R = source-receiver range, to predict sound pressure levels (SPL) at varying distances from source. Cylindrical spreading, SPL = SL – 10log(R), is usually assumed in shallow water, depth < R, where reflection of high frequency signals from the seabed results in approximately cylindrical propagation and therefore higher received spectrum levels than for spherically propagated low frequency signals (which penetrate the seabed). Given the large scale and varied water depths of the AA area, an intermediate spreading model, SPL = SL – 15log(R) has been used to inform the consideration (see Figure 5.2 in OESEA2 Environmental Report). Attenuation of signal with distance is frequency dependent, with stronger attenuation of higher frequencies with increasing distance from the source, due to a combination of reflection from sub-surface geological boundaries, sub-surface transmission loss due to frictional dissipation and heat; and scattering within the water column and sub-surface resulting from reflection, refraction and diffraction in the propagating medium.

occur in any one of the Blocks applied for[20] (Table 6.2). The work programme for the West of Shetland Blocks indicates that 3D seismic survey is proposed for Blocks 206/9b, 206/10b and 206/14.

For some of the sites (Yell Sound Coast SAC, Mousa SAC), land barriers between the site and Blocks applied for preclude tangible simple calculations of direct linear range and received noise levels within the sites. However, in these cases an estimate of minimum distance around land areas has been used.

It is indicated in Table 6.2 that all of the sites for which there are relevant qualifying marine mammal species are a sufficient distance from the Blocks that the estimated received sound levels will be considerably lower than the injury criteria proposed by Southall *et al.* (2007). The received levels will be below the inury criteria in cetaceans for both pulsed and non-pulsed sounds, and below that proposed for the onset of TTS for pulsed sounds (Southall *et al.* 2007), and the MTTS postulated for pulsed sounds in harbour porpoise (Lucke *et al.* 2007).

Table 6.2: Estimated received sound levels in relevant sites associated with a typical seismic survey

Site	Relevant qualifying Annex II species	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)
Yell Sound Coast	Harbour seal	45km from Block 206/10b	160
Mousa	Harbour seal	78km from Block 206/14	156
Sanday	Harbour seal	130km from Block 206/14	153
Faray and Holm of Faray	Grey seal	140km from Block 206/14	152
North Rona	Grey seal	240km from Block 206/14	149

Note: Assumes a source level of 250dB re 1μPa peak-to-peak, a correction factor of -20dB to compensate for horizontal array effects, and a propagation loss of 15log(R). Figures are rounded to the nearest whole number. Minimum straight line distance from the nearest Block to the site.

Deep geological seismic survey occurring in the proposed licence Blocks will be audible to seals over a large area of the coastal waters to the west of Shetland, characterised by moderate to very high marine usage by foraging harbour and grey seals (see Figure 6.1). Moderate to low densities are found further offshore in the area of the Blocks. Noise levels suggested to cause auditory damage in pinnipeds are rapidly attenuated with distance from source (see Table 6.1). For example, based on the proposed criteria of Southall *et al*. (2007) relating to pinnipeds and single pulsed sounds from a typical seismic survey, the range exceeding the injury criteria (onset of PTS) would extend to approximately 63.1m (p-p) from source, and for significant behavioural disturbance (onset of TTS) approximately 158.5m (p-p) from source – these ranges would not overlap with any relevant SACs due to their location relative to Blocks for which seismic survey is proposed. As noted above, marine mammal movements are not restricted to

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Frequency dependence due to destructive interference also forms an important part of the weakening of a noise signal.

[20] Assumes a source level of 250dB re 1 Pa peak-to-peak, a correction factor of -20dB to compensate for horizontal array effects, and a propagation loss of 15log(R). Figures are rounded to the nearest whole number.

within sites for which they are a qualifying feature and therefore seals could conceivably interact with any of the Blocks for which seismic is proposed.

DECC will expect the operator to provide sufficient information on the potential impact of the proposed activity on the qualifying sites in their application for a 3D seismic survey operation in Blocks 206/9b, 206/10b and 206/14. Based on the advice from SNCBs, DECC may undertake an HRA to determine whether the proposals will have an adverse impact on the site integrity that would undermine the site conservation objectives. Depending on the outcome of the assessment DECC may require additional mitigation measures or refuse consent.

Some sites are a considerable distance from the Blocks on offer (e.g. North Rona – 240km from Block 206/14). If significant ecological effects on prey species were to occur, even at considerable distances from the sites, these may influence the breeding population of the site. However, noise levels suggested to cause injury to fish (the primary prey species of seals) would not extend beyond a few tens of metres around the noise source. The range over which non-injurious disturbance effects on fish might occur is not possible to define, although available evidence suggests that the extent of any such disturbance of prey species is highly unlikely to undermine the conservation objectives in relation to harbour seals for the site (e.g. affect the distribution of species within the site, result in significant disturbance to the species or affect the viability of the population).

A period of concern for seismic survey has been identified for Block 206/14 between February and June with respect to fish spawning. There is a presumption of refusal for the activity concerned during these periods. However, it may be possible to agree appropriate mitigation measures at the project level to minimise potential adverse effects, and enable a waiver to be granted for the operations to proceed.

Noise levels associated with other activities potentially resulting from the licensing of Blocks such as rig site survey, VSP, drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from deep geological seismic survey, and are not expected to have an adverse effect on the integrity of the sites.

6.4.2 Migratory fish

The potential for acoustic disturbance effects was identified for the following riverine SACs due to their proximity to the West of Shetland Blocks and the presence of Atlantic salmon (unfavourable recovering) as a qualifying feature: Berriedale and Langwell Waters SAC, River Naver SAC, River Thurso SAC and River Borgie SAC. It should however be noted that these sites are at least 220km from the nearest Block (206/14). Salmonids play a critical role in the life cycle of the freshwater pearl mussel *Margaritifera margaritifera* (see Section 7.3), which is also a qualifying feature (unfavourable recovering) in the River Naver, River Borgie and Foinaven SACs. Any potential impacts on viability of the Atlantic salmon population, its distribution or supporting habitats, should also be considered in the context of the freshwater pearl mussel.

Atlantic salmon leave rivers to enter the marine environment during spring-summer as smolts, before migrating to feeding areas in Nordic Seas and West Greenland (Malcolm *et al.* 2010). Following 1-3 years at sea, adult salmon return to their home rivers primarily during summer months. Due to the highly localised range of noise levels likely to cause injury to fish, the potential for acoustic disturbance effects is restricted to disruption to salmon migration from, and principally to, the designated rivers. The potential for impact can be mitigated through timing of seismic survey to avoid the period of peak salmon entry into the rivers and consequently avoid undermining the conservation objectives in relation to both Atlantic salmon, and by association,

the freshwater pearl mussel. No Blocks are located close to the entrance of the relevant sites and therefore seismic survey activities are not expected to have an adverse effect on the integrity of the SACs.

Noise levels associated with other activities potentially resulting from the licensing of Blocks such as rig site survey, VSP, drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from deep geological seismic survey, and are not expected to adversely affect site integrity.

6.5 Regulation and mitigation

Both planning and operational controls cover acoustic disturbance resulting from activities on the UKCS, specifically including geophysical surveying and pile-driving. Application for consent to conduct seismic and other geophysical surveys is made to DECC using *Petroleum Operations Notice No 14* (PON14) which may be supported by an Environmental Assessment to enable an accurate assessment of the environmental effects of the survey (see Figure 2.3). Consultations with Government Departments and other interested parties are conducted as standard prior to issuing consent, and JNCC, Marine Scotland (MS), (and possibly others) may request additional risk assessment, specify timing or other constraints, or advise against consent. Any proposed activity with a potentially significant acoustic impact on a designated SAC or SPA would also be subject to the requirement for HRA.

All seismic surveys in the UK are required as part of consent to adhere to JNCC's *Guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys* (August 2010 revision reflects 2009 amendment to the Conservation (Natural Habitats, &c.) Amendment (No. 2) Regulations 2008 (Scotland) and the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (Offshore Marine Regulations, as amended in 2009 and 2010)). It is a condition of consents issued under Regulation 4 of the *Petroleum Activities (Conservation of Habitats) Regulations 2001* (& 2007 Amendments) for oil and gas related seismic surveys that the JNCC Seismic Guidelines are followed. European Protected Species (EPS) disturbance licences can also be issued under the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007*.

The guidelines require visual monitoring of the area by a dedicated Marine Mammal Observer (MMO) prior to a seismic survey being undertaken to determine if cetaceans are in the vicinity, and a slow and progressive build-up of sound to enable animals to move away from the source. Passive Acoustic Monitoring (PAM) may also be required. Seismic operators are required, as part of the application process, to justify that their proposed activity is not likely to cause a disturbance etc. under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) and *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended). This assessment should consider all operational activities including shooting during hours of darkness or in poor visibility.

In their latest guidelines, JNCC (2010b) advise that operators adopt mitigation measures which are appropriate to minimise the risk of an injury or disturbance offence[21] and stipulate, whenever possible, the implementation of several best practice measures, including:

[21] Defined under Regulation 39 1(a) and 1(b) (respectively) of the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended).

- If marine mammals are likely to be in the area, only commence seismic activities during the hours of daylight when visual mitigation using Marine Mammal Observers (MMOs) is possible.

- Only commence seismic activities during the hours of darkness, or low visibility, or during periods when the sea state is not conducive to visual mitigation, if a Passive Acoustic Monitoring (PAM) system is in use to detect marine mammals likely to be in the area, noting the limitations of available PAM technology (seismic surveys that commence during periods of darkness, or low visibility, or during periods when the observation conditions are not conducive to visual mitigation, could pose a risk of committing an injury offence).

- Plan surveys so that the timing will reduce the likelihood of encounters with marine mammals. For example, this might be an important consideration in certain areas/times, e.g. during seal pupping periods near Special Areas of Conservation for harbour seals or grey seals.

- Provide trained MMOs to implement the JNCC guidelines.

- Use the lowest practicable power levels to achieve the geophysical objectives of the survey.

- Seek methods to reduce and/or baffle unnecessary high frequency noise produced by the airguns (this would also be relevant for other acoustic energy sources).

Passive acoustic monitoring (PAM) may be used as a mitigation tool where JNCC and country conservation agencies deem it appropriate. Periods of seasonal concern for seismic survey are also identified for Block 206/14 considered in this AA (see Table 2.2), for which there would be a presumption against such activity taking place.

Like any offshore activity, seismic surveys are considered on a case-by-case basis, and DECC have the discretion to issue consents with conditions specific to activity taking place and the sensitivities within the area. In addition to the above measures, JNCC provide more specific advice for areas of high importance for marine mammals such as the West of Scotland, these include.

- The MMO should not have a dual role (e.g. Fisheries liaison), be experienced as a marine mammal observer and therefore be familiar with the JNCC guidelines.

- A proven (previously used successfully) PAM system should be used, operated by an experienced user.

- Consideration should be given as to whether one MMO and one PAM operative are adequate for the specifics of the survey.

- JNCC will advise that two MMOs should be used when daylight hours exceed approximately 12 hours per day (Between 1st April and 1st October north of 57° latitude), or the survey is in an area considered particularly important for marine mammals.

In addition to marine mammal sensitivities, disturbance to populations of Atlantic salmon can be mitigated through timing of seismic survey to avoid migratory periods and consequently

significant disturbance can be avoided. In particular JNCC[22] highlight the sensitive post-smolt migration period for Atlantic salmon between April and May, and that mitigation, including a presumption against seismic survey at this time, is considered.

6.6 Conclusions

Significant effects arising from acoustic disturbance were only considered possible for SACs with marine mammals and fish as a qualifying feature. Although seismic survey, drilling and other oil industry noise is detectable by marine mammals, waterbirds and their prey, there is no evidence that such noise presents a risk to the viability of populations in UK waters and specifically not within designated Natura 2000 sites (see Defra 2010). A significant effect on the features would require disturbance to the qualifying species and/or the distribution and viability of the population of the site which may arise from direct mortality, behavioural response with implications for reproductive success (e.g. disturbance at fixed breeding locations) or reduced long-term ecological viability (e.g. sustained displacement from foraging grounds). In the localised areas of Natura 2000 sites designated for marine mammals (and where marine mammals utilise space outside such sites), acoustic disturbance from seismic survey activity resulting from proposed licensing would be intermittent and there is no evidence that cumulative effects of previous survey effort have been adverse. Despite considerable scientific effort, no causal link, or reasonable concern in relation to population viability has been found.

For the West of Shetland Blocks under consideration, the closest SAC boundary for which there are noise sensitive features (Yell Sound Coast SAC, harbour seal) is approximately 40km (from Block 206/10b), however there is a land barrier between the site boundaries and the Block which precludes a simple calculation of direct linear range and received noise levels within the site (see above for indicative values used to provide general estimates for the purposes of assessment).

Bearing in mind the information presented above and in the Appendices, it is concluded at the currently available level of definition, the proposed licensing of the Blocks would not be expected to cause an adverse effect on the integrity of the relevant sites, taking account of the following:

- Should a 3D seismic survey be proposed in the Blocks (as indicated by the work programme), further HRA may be required to assess the potential for adverse effects on the integrity of sites once the area of survey, source size, timing and proposed mitigation measures are known and can form the basis for a definitive assessment.

- Should a rig site and/or VSP survey be undertaken as part of proposed drilling operations in any of the Blocks, further HRA may be required to assess the potential for adverse effects on the integrity of sites once the area of survey, source size, timing and proposed mitigation measures are known and can form the basis for a definitive assessment.

- It is considered reasonable to conclude that no adverse effects on the integrity of other SACs in the vicinity of the Blocks will result.

- The utilisation of areas outside the designated SAC boundaries is not well understood, but the known extensive range of grey and harbour seals, and available population monitoring

[22] JNCC's response to the 26th and 27th Seaward licensing Rounds.

indicates that neither previous activities, nor those associated with proposed licensing will undermine the conservation objectives of qualifying species.

- Individual activities (e.g. drilling, seismic) require individual consents which will not be granted unless the operator can demonstrate that the proposed activities which may include a 3D seismic survey will not adversely affect the site integrity of relevant sites. These activities will be subject to activity level EIA and HRA (where appropriate).

7 Consideration of potential effects from oil spills on relevant sites

7.1 Overview of spill effects and context

Oil spills can have potentially adverse environmental effects, and are accordingly controlled by a legal framework aimed at minimising their occurrence, providing for contingency planning, response and clean up, and which enables prosecutions. It is not credible to conclude that an oil spill will never occur as a result of 27th Round licensing, in spite of the regulatory controls and other preventative measures in place.

In April 2010, a major incident occurred in the US Gulf of Mexico. During drilling of an exploratory well in deep water approximately 50 miles offshore Louisiana, there was an explosion and fire on the semi-submersible drilling rig, Deepwater Horizon. The rig was drilling in a water depth of 5,000ft with the oil reservoir at 18,000ft. Several reports into the cause of the incident and implications for activities on the UKCS have been produced, with a number of recommendations being integrated into UK guidance (e.g. DECC 2012b). As part of the investigation UK regulators contacted their counterparts in the United States (the Bureau of Ocean Energy Management, Regulation, and Enforcement - BOEMRE) to understand the cause of the incident and whether there were implications for safety at offshore operations on the UK continental shelf. The independent, UK based, Maitland review panel (Maitland 2011) evaluated the recommendations emerging from these reports and considered their relevance to the oil and gas industry on the UKCS. They assessed to what extent modifications or improvements to the UK regulatory regime could be informed by lessons learnt from the Deepwater Horizon incident.

DECC (along with other parts of government) have considered the implications of these various findings and implemented a series of actions in response.

The Health and Safety Executive (HSE) is responsible for regulating the risks to health and safety arising from work in the offshore industry on the UKCS. Inspectors from HSE's Offshore Division undertake offshore inspections of well control/integrity arrangements and related safety issues, and also review well designs and procedures. In the UK a safety case regime exists with specific safeguards including:

- The *Offshore Installations (Safety Case) Regulations 2005* require written safety cases and risk assessments to be prepared by the operator, and then approved by HSE, for all mobile offshore drilling rigs operating in the UK.
- A system of well notification, where the HSE reviews well design and procedures.

- A requirement for the design and construction of a well to be examined by an independent and competent specialist.

- A scheme of independent verification of offshore safety critical equipment such as blowout preventers to ensure they are fit for purpose.

- Checks that workers involved in well operations have received suitable information, instruction, training and supervision.

- Offshore inspections of well control and integrity arrangements, and related safety issues, by specialist inspectors from HSE's Offshore Division.

- Weekly drilling reports submitted to HSE by operators.

A review has been carried out by DECC[23] which has found that the existing system is fit for purpose, but in light of the Deepwater Horizon spill the regime is being strengthened further:

1. DECC has increased the oversight of drilling operations through the recruitment of additional 'offshore environmental' inspectors in its Aberdeen office. This has increased the number of annual environmental inspections of mobile drilling rigs.

2. In light of the Gulf of Mexico incident, DECC has reviewed the indemnity and insurance requirements for operating in the UK Continental Shelf.

3. Industry trade association Oil and Gas UK established a group comprised of regulators, industry and trade union representatives (the Oil Spill Prevention and Response Advisory Group - OSPRAG) to examine the UK's strengths and weaknesses in responding to a Gulf like incident. OSPRAG was active for 16 months, before reaching conclusions that recommended the setting up of a number of bodies with responsibility for ensuring drilling operations in UK waters remain robust and fit for purpose. The Oil Spill Response Forum (under guidance of Oil and Gas UK) will keep the oil spill toolkit, including subsea dispersants and spill modelling, under review. The Well Life Cycle Practices Forum will have responsibility for drilling and well engineering management functions. Regular interaction between Oil and Gas UK and OPOL (Offshore Pollution Liability Association Limited) will be maintained to exchange views on financial responsibilities. Additionally, in June 2012, Oil and Gas UK issued draft guidelines on financial responsibility for well operations in the UKCS, including assessment methodology for potential costs of well control, pollution remediation and compensation.

4. In May 2011 exercise 'Sula' was undertaken to test the UK's capacity to respond to a deepwater drilling related oil spill to the West of Shetland. A tier 2/3 deployment demonstration took place in Sullom Voe, Shetland alongside a separate Emergency Equipment Response Deployment (EERD), designed to test the dispersion of free flowing oil from a well, clearing of a well head of debris and the placement of a capping device to close off the flow from a well. An independent assessment of the deployments concluded that the ability to deploy all the equipment mobilised for the exercises (including surveillance

[23] See: DECC (2012). Offshore Oil & Gas in the UK: Government Response to an Independent Review of the Regulatory Regime, December 2012.

equipment, aerial and surface dispersant application, containment and recovery and shoreline response) was proven and all the onshore equipment was seen in fully operational conditions with the oil spill response team fully conversant in its use.

5. DECC has issued letters (dated: 23rd December 2010, 21st July 2011, 20th September 2011) to all UK operators specifying a number of requirements and expectations regarding oil pollution prevention, response, emergency plans and consenting. These were combined in supplementary guidance issued by DECC[24] with OPEP guidance updated in July 2012[25].

6. The EU has asked companies operating in EU waters to provide assurances that they are ensuring safe practice and that they are able to take on full responsibilities for environmental and other damage if an incident were to occur.

The potential for oil spills associated with exploration and production, the consequences of accidental spillages, and the prevention, mitigation and response measures implemented have been assessed and reviewed in successive SEAs covering the UKCS area under consideration in the 27th Round, including the recent Offshore Energy SEA2. Previous SEAs have concluded that given the UK regulatory framework and available mitigation and response, in relation to objective risk criteria (such as existing exposure to risk as a result of shipping), the incremental risk associated with exploration and production (E&P) is moderate or low.

A large number of site- and activity-specific risk assessments have also been carried out as a component of Environmental Assessments and under the relevant legislation implementing the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) (see the *Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998*).

The following section provides a high-level overview of risks, regulation, contingency planning and response capabilities; followed by an assessment of risks presented to relevant sites by activities resulting from the proposed licensing of the 3 Blocks in the 27th Round. As risks tend to be generic between sites, these have been categorised based on ecological sensitivity and an evaluation of spill probability and severity.

7.2 Spill risk

Risk assessment, under the terms of OPRC, includes considerations of probability and consequence, generally comprising an evaluation of: historical spill scenarios and frequency, fate of spilled oil, trajectory of any surface slick, and potential ecological effects. These considerations are discussed below.

7.2.1 Historical spill scenarios and frequency

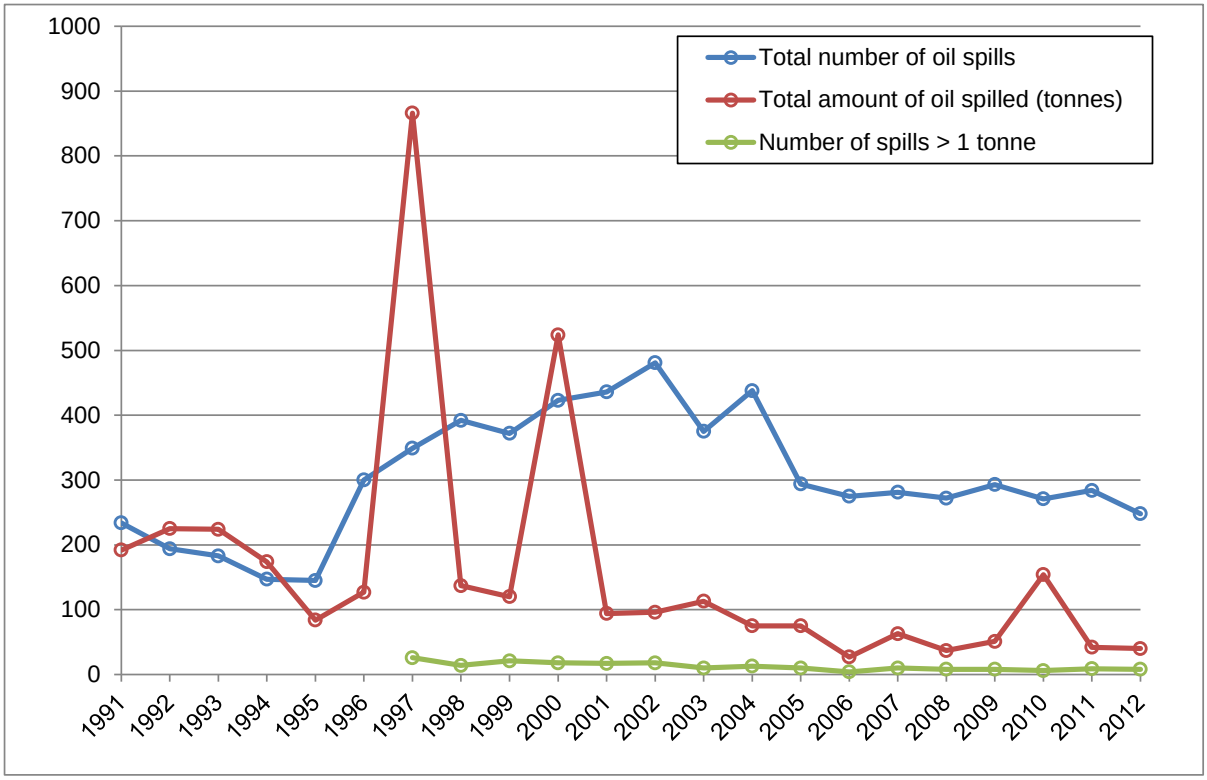
Oil spills on the UKCS have been subject to statutory reporting since 1974 under PON1 (formerly under CSON7); annual summaries of which were initially published in the “Brown

[24] DECC website https://www.gov.uk/oil-and-gas-offshore-environmental-legislation#supplementary-guidance-issued-following-the-deepwater-horizon-incident

[25] Guidance notes to operators of UK offshore oil and gas installations (including pipelines) on Oil Pollution Emergency Plan requirements https://www.gov.uk/oil-and-gas-offshore-emergency-response-legislation

Book" series, now superseded by on-line data available from the DECC website[26] (Figure 7.1). Discharges, spills and emissions data from offshore installations are also reported by OSPAR (e.g. OSPAR 2009).

Figure 7.1: Number and volume of reported oil spills from UKCS oil and gas installations over the period 1991-2012



Source: DECC website

DECC data indicates that the most frequent types of spill from mobile drilling rigs have been organic phase drilling fluids (and base oil), diesel and crude oil. Topsides couplings, valves and tank overflows; and infield flowlines and risers are the most frequent sources of spills from production operations, with most spills being <1 tonne. A large proportion of reported oil spills in recent years (since about 1990) have resulted from process upsets (leading to excess oil in produced water). Estimated spill risk from UKCS subsea facilities was equivalent to a risk of 0.003 spills/year for an individual facility, with almost all reported spills less than a tonne (<5bbl) in size.

Collisions between vessels and installations on the UKCS resulting in the spillage of significant quantities have oil have been few. Historical data (HSE 2003, OGP 2010) reveals that despite a significant increase in the number of offshore platforms and the use of mobile rigs on the UKCS, the mean incident frequency (i.e. a collision, irrespective of magnitude) over the period 1975-2001 has reduced, with data since 1995 showing a frequency of ~0.05 incidents per installation (fixed, floating and jack-up), per year. When just considering moderate to severe incidence frequency for all installations, this reduces to almost zero (1989-2001). The vast majority of incidents (~96%, UKOOA 2003) involved in-field vessels (particularly supply and standby

[26] Oil and chemical discharge notifications (accessed September 2013) https://www.gov.uk/oil-and-gas-environmental-data

vessels), with relatively few being related to passing traffic. See section 7.4 for related mitigation.

Well control incidents (i.e. "blowouts" involving uncontrolled flow of fluids from a wellbore or wellhead) have been too infrequent on the UKCS for a meaningful analysis of frequency based on historic UKCS data. A review of blowout frequencies cited in UKCS Environmental Statements as part of the OESEA2 gives occurrence values in the range 1/1,000-10,000 well-years. Accident statistics for offshore units on the UKCS (Oil and Gas UK 2009), indicated an annual average frequency of blowouts for mobile drilling units of 6.6×10^{-3} for the period between 2000 and 2007.

An annual review of reported oil and chemical spills in the UKCS – covering both vessels and offshore installations – is made on behalf of the Maritime and Coastguard Agency (MCA) by the Advisory Committee on Protection of the Sea (e.g. Dixon 2012). This includes all spills reported by POLREP reports by the MCA and PON1 reports to DECC - note that notifications of releases through the PON1 process are now being published on the DECC website on a monthly basis[27]. The review noted a 19.9% increase was evident in the total number of reports by offshore oil and gas installations during 2011, however further analysis indicated that reports of the number of oil spills from offshore oil and gas installations during 2011 was the same number as the mean annual total reported between 2000 and 2010. Of these releases, 62.9% were fuel, lubrication or hydraulic oils; additionally, of the discharges with volume information, 93% were less than 455 litres.

Since the mid-1990s, the reported number of spills has increased (Figure 7.1), consistent with more rigorous reporting of very minor incidents (e.g. the smallest reported spill in 2012 was 0.000001 tonnes). However, the underlying trend in spill quantity (excluding specifically-identified large spills) suggests a consistent annual average of around 100 tonnes. In comparison, oil discharged with produced water from the UKCS in 2012 totalled 2,248 tonnes (DECC website[28]).

Historic major spill events from UKCS production facilities include the 1986 Claymore pipeline leak (estimated 3,000 tonnes), 1988 Piper Alpha explosion (1,000 tonnes), 1996 Captain spill (685 tonnes), and 2000 Hutton TLP spill (450 tonnes). Although potentially significant at a local scale, these volumes are minor when compared to other inputs of oil to the marine environment, such as riverine inputs (OSPAR 2000).

Following the recent gas release and evacuation of personnel from Total E&P UK's Elgin production facilities, DECC convened a Government Interest Group (GIG) to enable interested parties, such as DECC, the Secretary of State's Representative, the Health and Safety Executive, the Scottish Government and the Maritime and Coastguard Agency, to share information about the incident and to discuss issues such as the operator's plans to stop the release. A GIG update[29] with respect to the environmental aspects of the incident indicated that the vast majority of the release from the 2012 Elgin field blowout was methane gas to atmosphere, but some of the condensate affected the sea surface resulting in a silvery sheen

[27] https://www.gov.uk/oil-and-gas-uk-field-data#oil-spills
[28] https://www.gov.uk/oil-and-gas-uk-field-data#oil-discharged-with-produced-water
[29] National Archives website – http://webarchive.nationalarchives.gov.uk/20121217150421/http://og.decc.gov.uk/en/olgs/cms/environment/about_the_offs/elgin_gig/elgin_gig.aspx

with occasional smaller patches of brown weathered material extending over some 5km^2 (DECC 2012c).

7.2.2 Trajectory and fate of spilled oil

The main oil weathering processes following a surface oil spill are spreading, evaporation, dispersion, emulsification, dissolution, oxidation, sedimentation and biodegradation. The anticipated reservoir hydrocarbon type in the West of Shetland Blocks is oil but condensate or gas may also be found. Therefore the potential risk of crude oil spills has been considered. The persistence of spilled crude oil depends on the characteristics of the oil, but typically is of the order of days to weeks. Diesel spills generally evaporate and disperse without the need for intervention. A major diesel spill of *ca.* 1000 tonnes would disperse naturally in about 8 hours and travel some 24km in conditions of a constant unidirectional 30 knot wind.

With respect to the recent Elgin gas release, the observed sea surface contamination (described above) was in line with modelling data derived for potential condensate spills, which predicted that there would be an equilibrium point when input was matched by natural loss as a result of evaporation and dispersion in the water column, with approximately 50% of the condensate evaporating within approximately 24 hours under conditions relevant to the Elgin release. The brown weathered material also appeared to disperse naturally and, during periods when the wind strength and wave height increased, this enhanced dispersion of the condensate and weathered material in the water column, reducing the quantity of material remaining on the sea surface (DECC 2012c).

Coincident with these weathering processes, surface and dispersed oil will be transported as a result of tidal (and other) currents, wind and wave action. The Blocks under consideration are on the edge of the shelf of the Faroe-Shetland Channel, in the strong northeast flowing branch of Atlantic Water Inflow into the Nordic Seas (Figure 7.2b). Generally, any oil slick front will be wind-driven on a vector equivalent to current velocity plus approximately 3% of wind velocity. Although strong winds can come from any direction and in any season, the predominant winds are from the south and southwest which for the West of Shetland Blocks would push spilled oil towards the northern islands of Shetland and the open Norwegian Sea.

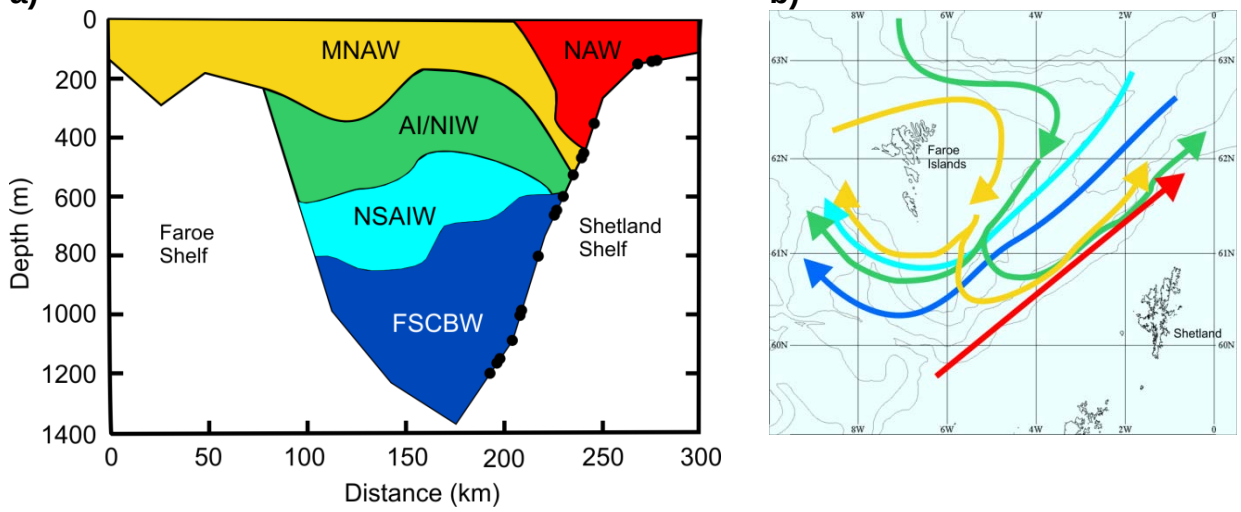
Along the western coasts of Shetland and Orkney, the combination of exposure to prevailing winds and deep, open offshore waters produces a high energy wave regime (annual mean significant wave height of 2.7m, ranging from a summer mean of 1.8m to a winter mean of 3.75m) (BERR 2008). Waves and turbulence at the sea surface can cause all or part of a slick to break up into fragments and droplets of varying sizes. These become mixed into the upper levels of the water column. Some of the smaller droplets will remain suspended in the sea water while the larger ones will tend to rise back to the surface, where they may either coalesce with other droplets to reform a slick or spread out to form a very thin film. The oil that remains suspended in the water has a greater surface area than before dispersion occurred. This encourages other natural processes such as dissolution, biodegradation and sedimentation to occur. The speed at which an oil disperses is largely dependent upon the nature of the oil and the sea state, and occurs most quickly if the oil is light and of low viscosity and if the sea is very rough (ITOPF website[30]).

[30] International Tanker Owners Pollution Federation (ITOPF) website http://www.itopf.com/marine-spills/fate/weathering-process/

The West of Shetland area is dominated by complex hydrography and bathymetry, making it a very dynamic environment. The UK sea area to the west of Shetland can be divided into the continental shelf (0-200m water depth), the continental slope (200 to 1,000m water depth) and the Faroe-Shetland Channel (>1,000m water depth). Within the continental slope and Faroe-Shetland Channel a number of different water masses occupy different depths of the water column (Figure 7.2a), with intermediate to shallow depth currents predominantly flowing in a north-east direction and deeper currents flowing to the south-west (Figure 7.2b, see SEA 4 for further details).

Figure 7.2: Water masses and ocean current circulation in the Faroe-Shetland Channel region

a) **b)**



Notes: a) Black circles represent sites with oil spill modelling results shown in Table 7.1. NAW = North Atlantic Water; MNAW = Modified North Atlantic Water; AI/NIW = Atlantic Intermediate/North Icelandic Water; NSAIW = Norwegian Sea Arctic Intermediate Water; FSCBW = Faroe Shetland Channel Bottom Water. b) Colours represent water masses shown in Figure 7.2a.
Source: After Turrell et al. (1999)

A review of 15 years of Environmental Statements was undertaken for Blocks to the West of Shetland (included Quadrants 165, 166, 175, 176, 202-206, 208, 209 and 212-218). Of these, those shown in Table 7.1 contained relevant oil spill studies, e.g. deterministic estimates of time to beach for a number of different spill scenarios and hydrocarbon types.

From Table 7.1, the time to beach for different locations (where beaching occurs) can be summarised by the following ranges:

- Shetland 35-269 hours (in winds >13 knots the shortest estimate reduces to 25 hours from Block 206/8)
- Faroe Islands 46-144 hours
- Orkney 45-269 hours
- Norway > 118 hours
- Foula 40-48 hours
- Mainland Scotland 75-133 hours

Table 7.1: Review of trajectory and stochastic oil spill modelling for West of Shetland exploration wells and developments

Block	Water depth (m)	Spill type	Spill size	Model used & conditions	Time to beach (trajectory modelling)	Likelihood of beaching (stochastic modelling)	Date of model run
204	350-500	Blowout, Schiehallion type crude	287,280m^3 over a 90 day period,	OSCAR 5, 30 knot onshore winds	Shetland (summer) 105hrs Shetland (winter) 198hrs	Scotland, Orkney, Norway 0-10%	2010
204/10	1,090	Blowout, Foinaven type crude	720m^3 over 24hrs	OSIS 3, 30 knot onshore winds	Shetland 45hrs Faroe 56hrs	UK, Faroes <1%	2002 & 2008
204/10a	1,000	Blowout, Foinaven type crude	13,991m^3 over 24hrs 195,888m^3 over 14hrs	OSIS 4.5, 30 knot onshore winds	Shetland 62hrs Shetland 62hrs Norway 193hrs Faroe 74hrs	Shetland 5 - 30% Norway <10% NW Shetland 60% S Shetland 30%	2011
204/14	*ca*, 1,000	Foinaven crude	Not stated	OSIS 2.0, 30 knot winds to variety of surrounding coasts	Foula 40hrs Shetland 42hrs Orkney 53hrs Caithness 75hrs	-	1999
204/14 & 204/15	*ca.* 800	Instantaneous release at surface of Foinaven crude	1,000m^3	OSIS 2.2.3, 30 knot winds to variety of surrounding coasts	Foula 40hrs Shetland 42hrs Orkney 45hrs Faroe 53hrs	-	1998
204/16	*ca*. 1,000	Blowout, Foinaven type crude	30m^3/hr 24hr period total 720m^3	OSIS 3, 30 knot wind to Shetland & Faroe	Foula 46hrs Shetland 67hrs Faroe 62hrs	-	2002
204/17	983	Blowout, type of crude not stated	4800 m^3 instantaneous Stochastic modelling of total spill of 15000m^3 over 120hrs	OSIS 3, 30 knot onshore winds	Foula 48hrs Shetland 63hrs Orkney 51hrs Faroe 59hrs	Shetland 5 to <10% Orkney, Faroe mainland Scotland 1 to <5%	2003
204/18b	982	Blowout, Brae Central type crude	Total 18,352 tonnes	OSIS 4.2, 30 knot onshore winds	Shetland 64hrs Faroe 94hrs	Total probability of beaching is 32% with the highest individual beaching probability 3.6% at Island of Westray, Orkney.	2011
204/20	350-450	Not given but Schiehallion crude spill	-	OSIS, 30 knot wind to Shetland	Shetland 45hrs	-	2000
204/21	*ca*. 800	Blowout, Brent type crude	Total 720m^3 over 24 hrs	OSIS 3, 30 knot wind to Orkney & Faroe	Orkney 51hrs Faroe 63hrs	-	2002
204/24,	500-550	Surface spill of	100 tonne	Not stated but probably	Shetland 45hrs	-	2000

Block	Water depth (m)	Spill type	Spill size	Model used & conditions	Time to beach (trajectory modelling)	Likelihood of beaching (stochastic modelling)	Date of model run
25, 19, 20		Foinaven crude		OSIS, 30 knot onshore winds	Orkney 48hrs Caithness 76hrs		
205/21a	156	Blowout, type of crude not stated	Total 720 tonnes over 24hrs	OSIS 3.1.1, 30 knot onshore winds	Foula 40hrs Shetland 256hrs	Shetland 1 to 10%	2009
205/26a	136	Instantaneous release, Arabian heavy type crude	2,000 tonnes	OSIS 3.1.1, 30 knot onshore winds	Orkney 48hrs Faroe 122hrs	42% total probability of beaching somewhere	2008
206/1, 205/5	600	Blowout, condensate & pipeline rupture	-	30 knot wind towards Shetland	Disperses within 3 to 4 days without beaching	N/A	2009
206/8	140	Blowout, Clair type crude	35,000m^3 over 14 days	OSIS 3, 30 knot onshore wind	Shetland 25hrs worst case (but in winds <13knots would not beach) Orkney 118-130hrs Faroe 122-133hrs Mainland Scotland 118-130hrs	-	2001
206/8	140	Blowout, Clair type crude Pipeline rupture of Clair crude	287,280m^3 of crude 3,400m^3 of crude	OSCAR	Blowout: Shetland 36hrs (39hrs in winter) UK-Faroe median line 168hrs Faroe 444hrs (although 0% beaching probability) Norway min.17 days (typically 58 days) Pipeline rupture: Shetland 14hrs UK-Faroe median line 201hrs	3% Shetland 0% Orkney 0% Faroe 0% Mainland Scotland 10-60% Norway	2010
208/11	1,167	Blowout, Alwyn type condensate	57,652m^3 over 14 days	OSIS, 30 knot towards Shetland and Faroes	Shetland 55 hours Faroes disperses after 18 days and crosses the median line after 36 hours	-	2012
208/17	668	Blowout, Shah Deniz type condensate	169,175m^3over 35 days	OSIS, 30 knot wind towards Shetland and Faroe	Shetland 50hrs Faroes 43hrs to cross median line, disperses after 38 days	Shetland 2-10% Norway 2%	2012
213/25	1,178	Instantaneous surface	1,000m^3	OSIS, 30 knot onshore	Shetland 35hrs	-	1998

Block	Water depth (m)	Spill type	Spill size	Model used & conditions	Time to beach (trajectory modelling)	Likelihood of beaching (stochastic modelling)	Date of model run
		release, Foinaven type crude		winds to variety of surrounding coasts	Orkney 70hrs Caithness 133hrs		
213/26	1,200	Blowout, Don type crude	1,166 tonnes over 6 hrs	OSIS, 30 knot wind towards a variety of coastlines	Faroe 77hrs Norway 167hrs Shetland 59hrs	Faroe, Norway, Shetland <10%	2005
213/27	*ca.* 1,200	Blowout, Foinaven type crude	1,116 tonnes over 6 hrs	OilMap 30 knot wind towards a variety of coastlines	Faroe 103hrs Shetland 269hrs Norway 118hrs Orkney 269hrs	Faroe, Norway, Shetland, Orkney 1-10%	2005
213/27	1,150	Blowout, Rosebank type crude	1,166 tonnes	OSIS, 30 knot wind towards a variety of coastlines	Faroes 109hrs Shetland 58hrs	Shetland 21%	2004
214/30a	435	Blowout, Malampaya type condensate	2,000 barrels (318m^3)	OSIS, 30 knot wind towards a variety of coastlines	Shetland disperses within 19km and 10 hours Faroes disperses within 16km	N/A	2009
217/15	1569	Spill of Rosebank type crude	1,400m^3 of crude	OSIS, 30knot wind towards a variety of coastlines	Faroe 144hrs Shetland 146hrs Orkney 176hrs Norway 145hrs	Overall probability of 8%	2010

Stochastic and deterministic modelling results for diesel spills suggest that there was either an insignificant (<1%) or zero percentage chance of beaching occurring, generally with full dispersion occurring in open water. The sites for which oil spill modelling has been undertaken represent the full depth of the water column (black dots on Figure 7.2a) and all of the water masses and currents shown in Figure 7.2b. Estimates suggest that beaching from a spill would not occur for at least 25h from any of the West of Shetland Blocks under consideration, rising to >35h under wind conditions <13 knots. It should, however, be noted that these estimates are using worst case scenarios of unconstrained blowouts with no intervention, combined with constant winds from one direction over a significant period of time, which realistically is improbable.

The likelihood of beaching of hydrocarbons on Shetland from a spill was a 60% probability for NW Shetland from a blowout from Block 204/10a (30% probability for southern Shetland). The highest probability of beaching on Norway (60%) came from a blowout from Block 206/8, although this was expected to occur after a minimum time period of 17 days. The likelihood of beaching at other locations was <10%. The probability of beaching, combined with time taken for any spilled hydrocarbon to beach, confirms that the screening criteria used (see DECC 2012a) to identify any relevant sites at risk from oil spills is relevant for the 3 West of Shetland Blocks.

Exercise Sula, which tested the UKs response capability to a deep water drilling spill to the west of Shetland, was based on a blowout event from a well in Block 204/10 (1,090m water depth) 86 miles from Shetland. The exercise effectively tested the UK response system, the National Contingency Plan (NCP) and individual response organisations (including the MCA, DECC, SOSREP, Shetland Islands Council and Scottish Standing Environment Group) which would be involved in a spill to the west of Shetland. Independent assessors concluded that the UK pollution response system could effectively respond to a deep water drilling incident to the west of Shetland in the timescales involved.

To support environmental assessments of individual drilling or development projects, modelling is carried out for a major crude oil release, corresponding to a blowout (i.e. a worst case scenario based on expected well flow rates and nature of the crude oil, however unlikely that scenario might be), and for smaller diesel or fuel oil releases, which are expected to be less persistent. Also in response to the Deepwater Horizon spill, operators are required to consider and provide evidence of planning for the eventuality that a relief well may need to be drilled (e.g. time to acquire a suitable rig, time to drill the well etc.). Representative modelling cases from various parts of the UKCS have been reviewed by successive SEAs.

7.2.3 Potential ecological effects

The most vulnerable components of the ecosystem to oil spills in offshore and coastal environments are seabirds and marine mammals, due to their close association with the sea surface. Seabirds are affected by oil pollution in several ways, including oiling of plumage resulting in the loss of insulating properties and the ingestion of oil during preening. Pollution of the sea by oil, predominantly from merchant shipping, can be a major cause of seabird mortality. Although locally important numbers of birds have been killed on the UKCS directly by oil spills from tankers, for example common scoter off Milford Haven following the Sea Empress spill in 1996, population recovery has generally been rapid.

The Offshore Vulnerability Index (OVI) developed by JNCC (Williams *et al*. 1994) is used to assess the vulnerability of bird species to surface pollution; it considers four factors:

- the amount of time spent on the water
- total biogeographical population
- reliance on the marine environment
- potential rate of population recovery

Vulnerability scores for offshore areas (see Table 7.2, below) are determined by combining the density of each species of bird present with its vulnerability index score. Of the species commonly present in UK offshore waters, gannet, skuas and auk species (e.g. relevant SPA sites include Foula, Fetlar, Noss, Fair Isle, Sumburgh Head) may be considered to be most vulnerable to oil pollution due to a combination of heavy reliance on the marine environment, low breeding output with a long period of immaturity before breeding, and the regional presence of a large percentage of the biogeographic population. In contrast, the aerial habits of the fulmar and gulls, together with large populations and widespread distribution, reduce vulnerability of these species. Vulnerability is seasonal, with a general trend of high vulnerability in coastal areas adjacent to colonies during the breeding season. In winter and through spring, vulnerability in inshore waters can also be very high in some areas.

Table 7.2: Monthly seabird vulnerability to surface pollution in relevant 27th Round Blocks

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
206/3	4	2	2	3	2	3	2	3	4	3	4	3	4
206/4	4	2	2	4	2	3	2	4	4	3	4	3	4
206/5	3	2	2	2	1	2	1	3	3	3	3	3	3
207/1	3	3	2	2	1	2	1	3	3	3	3	3	3
206/8	4	1	2	3	2	3	1	4	4	3	3	4	3
206/9	4	1	2	3	2	3	1	4	4	3	3	4	3
206/10	3	1	2	2	1	2	1	3	2	3	3	4	2
207/6	3	2	2	2	1	2	1	3	2	3	3	4	3
206/13	4	1	3	3	2	3	1	4	4	4	3	-	3
206/14	4	1	3	3	2	3	1	4	4	4	3	-	3
206/15	4	1	2	2	2	2	1	3	2	4	3	4	3
207/11	4	2	2	2	2	2	1	3	2	4	3	4	3
206/18	2	2	1	1	1	1	1	2	1	1	2	4	1
206/19	2	2	1	1	1	1	1	2	1	1	2	4	1
206/20	2	2	1	1	1	1	1	2	1	1	2	4	1

Note: 1 = very high, 2 = high, 3 = moderate, 4 = low.
Source: JNCC (1999).

Fortunately, there is little experience of major oil spills in the vicinity of seabird colonies in the UK. In 1993 the Braer ran aground at Garth's Ness in Shetland and began leaking Norwegian Gulfaks crude oil from the moment of impact. In total 85,000 tonnes of oil was spilled by the Braer. 207 birds were received at the cleaning centre set up to deal with oiled birds, of these 23 were successfully rehabilitated, while an estimated 31 out of 34 seals were successfully rehabilitated. There was difficulty in determining the number of birds that died as a result of the oil as some would never have been found and stormy weather at the time of the spill caused a high mortality of storm victims that became oiled after death. 1,538 dead birds were found on the beaches including shag (857), black guillemot (203), kittiwake (133), and long-tailed duck (96), as well as great northern diver (13), eider (70) and great black-backed gull (45). There was a clear excess of females over males found. The main groups of breeding seabirds

affected by the spill were locally resident species, while summer visitors would have been out of Shetland waters at the time of the spill. In general the 1993 breeding season was successful for most species that may have been affected by the oil spill, with the exception of shag and black guillemot (SOTEAG 1993, DTI 2003).

Fortunately, the timing and location of the spill, two of the most important factors that determine the extent of the effect on the fauna and in the case of the Braer spill, the stormy weather, resulted in the rapid dispersion of the oil in the water column and within a short period (in terms of oil spills), the effects were rapidly reduced. Long term effects on wildlife have proved to be less than first feared with the most notable impact on breeding populations of resident seabirds closest to the spill (SOTEAG 1993).

As the major breeding areas for most wildfowl and wader species are outside the UK (in the high arctic for many species), population dynamics are largely controlled by factors including breeding success (largely related to short-term climate fluctuations, but also habitat loss and degradation) and migration losses. Other significant factors include lemming abundance on arctic breeding grounds (e.g. white-fronted goose). Variability in movements of wintering birds, associated with winter weather conditions in continental Europe, can also have a major influence on annual trends in UK numbers, as can variability in the staging stops of passage migrants.

Assessments are currently ongoing to document and quantify levels of injury and pathways of exposure for bird species resulting from the Deepwater Horizon incident. These assessments will use the results of aerial and beach bird surveys, alongside laboratory analysis and detailed modelling (Natural Resource Damage Assessment (NRDA) 2012).

Oil spill risks to marine mammals have been reviewed by successive SEAs[31] for previous Licensing Rounds and their supporting technical reports (e.g. Hammond *et al*. 2004, Hammond *et al*. 2008).

Generally, marine mammals are considered to be less vulnerable than seabirds to fouling by oil, but they are at risk from hydrocarbons and other chemicals that may evaporate from the surface of an oil slick at sea within the first few days, and any accidental ingestion or breathing of oily fumes could cause physiological stress (Law *et al.* 2011). Symptoms from acute exposure to volatile hydrocarbons include irritation to the eyes and lungs, lethargy, poor coordination and difficulty with breathing. Individuals may then drown as a result of these symptoms (Hammond *et al*. 2002).

The US National Oceanic and Atmospheric Administration (NOAA) reported a cetacean Unusual Mortality Event (UME)[32] in the northern Gulf of Mexico, with 754 cetacean strandings (5% stranded alive, 95% stranded dead) reported between 1st February 2010 and 15th July 2012 (NOAA Fisheries website[33]). This UME coincided with the Deepwater Horizon incident (April-August 2010) in the area, although 114 of the 754 strandings occurred prior to the blowout

[31] See: Offshore Energy Strategic Environmental Assessment (SEA): An overview of the SEA process.
[32] An unusual mortality event (UME) is defined under the US Marine Mammal Protection Act 1972 (as amended) as: "a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response."
[33] NOOA Fisheries website (accessed October 2012)
http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm

incident. An investigation is currently ongoing into the cause of the event, including direct or indirect effects of the Deepwater Horizon oil spill and clean up, although no definite cause or link has currently been identified (NOAA Fisheries website).

Grey and harbour seals come ashore regularly throughout the year between foraging trips and additionally spend significantly more time ashore during the moulting period (February-April in grey seals and August-September in harbour seals) and particularly the pupping season (October-December in grey seals and June-July in harbour seals). Animals most at risk from oil coming ashore on seal haulout sites and breeding colonies are neonatal pups, which rely on their prenatal fur and metabolic activity to achieve thermal balance during their first few weeks of life, and are therefore more susceptible than adults to external oil contamination.

Direct mortality of seals as a result of contaminant exposure associated with major oil spills has been reported, e.g. following the Exxon Valdez oil spill in Alaska in 1989. Animals exposed to oil over a period of time developed pathological conditions including brain lesions. Additional pup mortality was reported in areas of heavy oil contamination compared to un-oiled areas.

Coastal otter populations are also vulnerable to fouling by oil, should it reach nearshore habitats. They are closely associated with the sea surface and reliant upon fur, rather than blubber, for insulation.

Benthic habitats and species may be sensitive to deposition of oil associated with sedimentation, or following chemical dispersion. The proportion of a surface spill that is deposited to the seabed might be expected to increase as a result of high turbulence and suspended solids concentrations in the water column, both associated with storm conditions in shallow water. Studies of macrobenthic infauna following the *Braer* spill (Kingston *et al*. 1995), which occurred under such conditions, found no significant changes in benthic community structure, as characterised by species richness, individual abundance and diversity, which could be related to the areas of seabed affected by the spill. This may have been because Braer oil was of low toxicity, or because the sampling programme was carried out too soon after the spill to enable the full effects of its impact to be detected. In recognition of this as part of the DECC SEA programme further sampling of the study area has been conducted, ten years after the spill, results from which have indicated a substantial decline in sediment hydrocarbon concentrations.

In contrast, evidence from the Florida barge spill (Buzzards Bay, Massachusetts, September 1969, in which 700m^3 of diesel fuel were released) suggests that in certain circumstances, contamination from oil spills could be long-term. Monitoring immediately following the spill suggested rapid recovery (reviewed by Teal & Howarth 1984), while subsequent studies (sampling in 1989) indicated that substantial biodegradation of aromatic hydrocarbons in saltmarsh sediments had occurred (Teal *et al.* 1992). However, thirty years after the spill, significant oil residues remain in deep anoxic and sulphate-depleted layers of local salt marsh sediments (Reddy *et al.* 2002, Peacock *et al.* 2005). The ecological consequences of this residual contamination are unclear, although there is potential for remobilisation of sediment-bound contaminants through bioturbation or storm events (in which case, aerobic biodegradation would be expected to be rapid).

A post spill damage assessment, remediation and restoration programme is currently underway in the Gulf of Mexico following the Deepwater Horizon event. Results from sampling in the 4 months after the stabilisation of the well showed no deposits of liquid phase oil from the spill in sub-surface sediments beyond the shoreline, although tar mats were present in shallow sub-

tidal areas near the shore and there were traces of oil in deep-sea sediments within approximately 6 miles of the wellhead (Gulf Science Monitor 2010). The results found that within the 4 month period <1% of water samples and ~1% of sediment samples taken exceeded US environmental protection agency's aquatic life benchmarks for polycyclic aromatic hydrocarbons (PAH), with all of the samples exceeding the benchmark being taken within 2 miles (3km) of the wellhead. There is evidence of dead or dying corals within two hard-bottomed coral communities *ca*. 5 and 11km from the wellhead respectively, although further interpretation and analysis of data is currently ongoing (NRDA 2012).

With respect to the recent Elgin gas release, sampling and monitoring programmes to date indicate that it is considered unlikely that the incident has had any significant impact on marine organisms in the water column, and likely that any impact on seabed marine organisms will be restricted to the area immediately surrounding the platform, an area that has already been impacted by routine discharges relating to previous drilling operations. Any hydrocarbons entering the water column would have been widely dispersed, and rapidly broken down by marine bacteria. Whilst the location and nature of the release, and the comparatively small area affected, indicated that the potential impact on marine mammals and seabirds was likely to be insignificant, Total have instructed a specialist contractor to undertake bespoke aerial surveys to quantify and potentially identify any marine mammals or seabirds in a 200km^2 area around the Elgin facilities (DECC 2012c).

Those coastal and marine Annex I habitats which are most sensitive to oil spills are identified in Table 7.3, below. Generally, sheltered habitats of lower exposure to wave energy are considered most vulnerable; oil may persist for long periods in such environments.

7.3 Implications for relevant sites

The re-screening process (Appendix B) identified the potential for oil spill effects at relevant sites. All sites where the potential for effects were identified are listed in detail in Appendix C. The identification of potential effects from oil spills on specific relevant sites considers the following factors:

- Oil spill probability and severity (taking into account distance from Blocks under offer, and probable hydrocarbon type)
- The ecological sensitivity of the qualifying feature(s) to oil spills
- Connected with the above, in what way an oil spill would have an immediate effect on the conservation objectives of SACs and SPAs as listed in Appendix C, and any long-term implications of a spill on these objectives

It should be noted that at a project level, DECC requirements for the preparation of OPEPs and ES submissions include, amongst other mitigation and response criteria, the modelling of a worst case blowout scenario considering a specific release location, crude oil type and historic metocean conditions as well as an unlikely 30 knot onshore wind, over a release time of 10 days. Detailed potential effects of an unmitigated release on Natura 2000 sites beyond a generic consideration would be considered at the project level.

7.3.1 Special Areas of Conservation

The ecological sensitivity of the qualifying features of relevant sites to oil spills varies and post-incident monitoring guidelines produced as part of the "PREMIAM: Pollution Response in

Emergencies Marine Impact Assessment and Monitoring" project (Law *et al.* 2011), provide information on the sensitivity and vulnerability of relevant habitats and species. Additionally, where available, Regulation 35 advice is provided on a site specific basis which considers the sensitivity of a given site to activities such as oil and gas exploration and production. For several Annex I habitats and Annex II species, it is considered that any potential source of effect is unlikely to degrade the qualifying habitat or habitat of species, or undermine the conservation objectives of related sites. These include:

- **Submerged reefs** – With respect to subtidal rock, the lack of substrata that could retain persistent oil contamination means that any impacts are only likely to be due to the acute effects of the dispersed oil, unless chronic oiling seeps down from an intertidal oil source. Generally considered unusual for notable quantities of dispersed oil from spills to reach depths greater than 10m, but there are known cases where this has happened (Law *et al.* 2011). Therefore not generally vulnerable to surface oil pollution, except possibly following application of chemical dispersants (generally not permitted in waters shallower than 20m). It is not expected that the extent, distribution or functioning of these habitats would be significantly affected, and therefore similarly, those of any species associated with, or relying on the functioning of these habitats.

- **Submerged sandbanks** – Dispersed oil in water and oil bound to shoreline sediments can make its way down to the seabed and contaminate subtidal sediments. Impacts to seabed sediment fauna have been described after a number of oil spills, but normally only in shallow depths where oil in water concentrations were particularly high or close to sandy beaches (Law *et al.* 2011). Therefore not generally vulnerable to surface oil pollution, except possibly following application of chemical dispersants (generally not permitted in waters shallower than 20m).

- **Lagoons, dunes** – sites above Mean High Water Springs are not generally vulnerable to surface oil pollution, except possibly to wind-blown oil or evaporated hydrocarbons. No cases of oil or chemical spills contaminating lagoons in UK or north-west Atlantic coasts have been found. Most UK lagoons are not very vulnerable to marine spills and their vulnerability will be dependent on the frequency and route by which seawater enters the lagoon. For those with narrow entrances, it is relatively simple to protect them by damming or booming (Law *et al.* 2011).

- **Sea cliffs, sea caves** – The vulnerability of rocky shores is mainly dependent on the wave exposure. Exposed rocky shores are normally considered to be one of the least vulnerable habitats to oil spills, because the oil is quickly removed by wave action. Sheltered rocky shores are often more vulnerable and sensitive, particularly if they include lots of rockpools and crevices (Law *et al*. 2011). It is not expected that the extent, distribution or functioning of these habitats would be significantly affected, and therefore similarly, those of any species associated with, or relying on the functioning of these habitats such that conservation status would be detrimentally affected.

- **Terrestrial and freshwater aquatic species** – the potential for significant effects on the conservation objectives of these species and their supporting habitats is essentially negated by their distribution, as these features do not utilise marine or estuarine environments. Species include freshwater pearl mussel (*Margaritifera margaritifera*), and non-coastal otter populations (*Lutra lutra*), though it should be noted that salmonids play a critical role in the life cycle of the freshwater pearl mussel, and potential indirect effects of this association are considered in the assessment below.

Table 7.3 provides information on the Annex I habitats and Annex II species which may have their conservation objectives undermined if affected by an oil spill – those sites for which such potential effects from fuel and/or crude oil spills has been identified (see Appendix B) are listed. The relevant Blocks from which spills could theoretically affect the sites are also listed although for the purpose of the AA, these are based on basic proximity to the sites and the nature of the qualifying features rather than detailed information from oil spill modelling. A full impact assessment of the proposed activities must be provided at the project level and (where relevant) an HRA would be undertaken. In addition, an oil pollution emergency plan (OPEP) must be in place before exploration and appraisal drilling activities are permitted. Based on the limited information available on the foraging of Annex II qualifying species from sites within the area (see Section 6.4), relevant Blocks where qualifying species may forage are identified in Table 7.3. Note: several sites are represented in more than one risk category.

Table 7.3: Annex I habitat types and Annex II species potentially vulnerable to oil spills

Mudflats and sandflats
Number of physical and biological characteristics of sediment shores that can influence their vulnerability and sensitivity, including wave exposure, shore topography, sediment composition, height of water table, presence of large burrows, abundance and diversity of infauna, and use of the shore by birds for feeding and roosting. Wave-exposed clean sandy shores are often considered to have a low vulnerability and sensitivity due to the natural cleaning of the waves and the relatively poor fauna in the sediment (Law *et al.* 2011). Particularly vulnerable in sheltered areas where wave energy is low. The biological communities associated with these sites are related to the degree of sheltering and subsequent sediment type; sheltered sites with fine, muddy sediments may support a high diversity and abundance of invertebrates and waterfowl. **Sites potentially at risk (Blocks from which an oil spill could directly impact site):** Block 206/14: Sanday SAC
Estuaries
Complexes of several subtidal and intertidal habitats with varying freshwater influence. The sediments of estuaries support various biological communities, while the water column provides an important habitat for free-living species, such as fish, and juvenile stages of benthic plants and animals. Estuaries often contain several different Annex I habitats. **Sites potentially at risk (Blocks from which an oil spill could directly impact site):** None
Saltmarshes
Comprise intertidal mud and sandflats colonised by vegetation due to protection from strong wave action. Pioneering saltmarsh vegetation exists where tidal flooding is frequent, with progression to more diverse, stable communities in upper reaches where tidal flooding is less frequent. Upper reaches can be valuable for plants, invertebrates and wintering or breeding waterfowl. Generally considered to be very vulnerable to oil spills, because they form in the upper part of sheltered muddy shores where oil becomes concentrated. Once oil gets into a marsh it is trapped by the vegetation where it becomes difficult to remove and causes long-term contamination (Law *et al.* 2011). **Sites potentially at risk (Blocks from which an oil spill could directly impact site):** None
Inlets and Bays
Large indentations of the coast, and generally more sheltered from wave action than the open coast. They are relatively shallow, with water depth rarely exceeding 30m, and support a variety of subtidal and intertidal habitats and associated biological communities. **Sites potentially at risk (Blocks from which an oil spill could directly impact site):**

Block 206/14: Sullom Voe SAC

Cetaceans

Sites comprise a variety of marine habitats utilised by cetaceans for foraging and other activities, with extensive areas beyond the site boundary also utilised. Much of the evidence of cetacean injuries is circumstantial, but it seems likely that individuals are occasionally exposed to oil from large spills, sometimes being attracted to the spill area by the response activity. While their skin is not thought to be particularly sensitive to oil, any accidental ingestion or breathing of oily fumes could cause physiological stress (Law *et al.* 2011).

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
None

Seals

Designated sites comprise coastal habitats (beaches, estuaries, sandflats and rocky shores) supporting important breeding colonies of harbour seals (*Phoca vitulina*) and/or grey seals (*Halichoerus grypus*). Seals spend considerable periods of time at these sites during the breeding season and during the moult. Seals forage for prey in surrounding waters and also travel considerable distances beyond the boundaries of sites (particularly grey seals) (see Section 6.4.1.6). Toxic effects from oil vapours and aerosols can have severe effects on respiration and the nervous system and can result in death. If seals are trapped near the source of a spill, they may be seriously affected; particularly if the oil is light with a large proportion of aromatic hydrocarbons. Seal pups are likely to be more sensitive than the adults, and pups trapped on beaches when oil comes ashore will be more vulnerable (Law *et al.* 2011).

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
Block 206/14: Mousa SAC (harbour seal), Yell Sound Coast SAC (harbour seal), Faray and Holm of Faray SAC (grey seal), Sanday SAC (harbour seal), North Rona SAC (grey seal). For both species, coastal waters close to haul out sites on Shetland and Orkney support moderate to very high densities of seals. Low to moderate densities are found further offshore in the area of the Blocks.

Coastal otters

Sites contain shallow, inshore coastal areas utilised by important populations of otter (*Lutra lutra*) for feeding. Some coastal otters feed in nearshore and intertidal areas, but their reliance on these habitats and associated food resources is not well established as they are also likely to feed in freshwater habitats nearby. While there was some evidence of impacts to otter populations following the 1993 Braer oil spill in south Shetland there was no recorded evidence of impacts from the 1996 Sea Empress spill to otters in Pembrokeshire. However, the difficulty of making good estimates of population size and measuring impacts makes assessment of vulnerability unreliable (Law *et al.* 2011).

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
Block 206/14: Yell Sound Coast SAC
Block 206/10b: Hascosay SAC

Atlantic salmon

Fish are at greatest risk from contamination by oil spills when the water depth is very shallow. Below 10m, in open waters, the likelihood that contaminant concentrations will be high enough to affect fish populations is very small, even if chemical dispersants are used to disperse oil. In shallow or enclosed waters however, high concentrations of freshly dispersed oil may kill some fish and have sublethal effects on others. Juvenile fish, larvae and eggs are most sensitive to the oil toxicity (Law *et al*. 2011). Available evidence suggests that salmon smolts utilise shallow water depths (1-6m) and that adults show varying behaviour, swimming generally close to the surface (0- 40m depth), with occasional deeper dives – e.g. Holm *et al.* (2005, cited by Malcolm *et al.* 2010) noted dive depths of between 85 and 280m. The most sensitive period for Atlantic salmon is likely to be during the peak smolt run,

rather than when adult salmon are returning to rivers. This is because Atlantic salmon return to natal rivers throughout the year, whereas the smolt run is more seasonally defined (April and May)[34].

As salmonids play a critical role in the life cycle of the freshwater pearl mussel, any significant impact on populations of Atlantic salmon may also affect those of the pearl mussel (e.g. Foinaven).

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
Block 206/14: Foinaven SAC, River Borgie SAC, River Naver SAC, River Thurso SAC, Berriedale and Langwell Waters SAC

7.3.1.1 Consideration

Non-statutory advice from SNH (2006a, c, d, e, f) on the sensitivity and vulnerability of SACs designated for seal features (e.g. Mousa SAC, Yell Sound Coast SAC, Faray and Holm of Faray SAC, Sanday SAC, North Rona SAC) indicates that offshore and onshore oil related development and activities have the potential to cause disturbance to seals (particularly during the breeding, pupping and moulting seasons) and deterioration of their associated habitats through the increased risk of pollution, vessel movements and direct loss. This would include all operational aspects e.g. seismic surveys, exploration, installation or routine inspection and maintenance of any associated infra-structure, and any long term monitoring programmes in place. SNH (2006a, b, e) advises that local authority and harbour oil spill contingency plans, including testing of emergency response fire-fighting equipment, should take into account the qualifying interests and importance of Yell Sound Coast SAC, Sullom Voe SAC and Mousa SAC. No specific advice is provided by SNH with regards to oil spills and the Faray and Holm of Faray SAC, Sanday SAC or Mousa SAC, though the presence of grey and harbour seal at these sites would suggest that comparable considerations should be made.

Accidental or deliberate discharge of oil by any type of operation has the potential to cause deterioration to seal haul outs (e.g. Yell Sound Coast SAC, Sanday SAC, Mousa SAC). Both oil spills and clean-up techniques (e.g. the use of dispersants, mechanical clean-up) have the potential to cause deterioration of qualifying interests through direct impact, or toxic chemicals causing lethal or sublethal effects on marine biota, which would cause subsequent changes in community structure. Such effects could alter the structure and function of qualifying habitats, and the viability of typical species as components of these habitats, and therefore undermine conservation objectives associated with qualifying features.

SNH (2006a, b) do not provide specific advice with regards to the potential for spills from oil and gas activities to impact the habitat features lists in Table 7.3 above (e.g. mudflats and sandflats, inlets and bays) or coastal otter (e.g. for Yell Sound Coast SAC), however advice on marine traffic is relevant (i.e. that accidental oil (or other chemical) spillage from commercial vessels have the potential to cause deterioration of qualifying habitats and communities through direct and / or indirect impacts.

The likelihood of a large oil spill is extremely low (blowout occurrence frequency in the range of 1/1,000-10,000 well years, see Section 7.2). The proposed work programme includes a contingent well. Therefore, unless drilling cannot be undertaken due to, for instance, the requirement to obtain more information (e.g. through additional seismic survey), a well will be drilled in one of the licence application Blocks. The potential for spills to cause deterioration of

[34] JNCC's response to the 26th and 27th Seaward licensing Round.

qualifying habitats (and supporting habitats of Annex II species) or significant disturbance of Annex II species (e.g. from spill response activities) will be determined by the location, nature and timing of activities which are currently unknown (Note: oil spills are an accidental event and not a planned activity). Therefore, a detailed assessment of the potential for effects of a particular operation cannot be made at this time, but would be required subsequently, as part of project-level EIA. Where relevant, an HRA may also be undertaken for the proposed operations.

Following licensing, specific exploration drilling activities require permitting (see Figure 2.2) and those considered to present a risk to relevant sites would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are required of operators and monitored by the regulator for offshore exploration and production (Section 7.4). Detailed potential effects of such a release on Natura 2000 sites would be considered at the project level.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of a well, will not have an adverse effect on the integrity of relevant SACs.

7.3.2 Migratory fish

(Annex II qualifying species: Atlantic salmon *Salmo salar* and freshwater pearl mussel *Margaritifera margaritifera*)

Atlantic salmon undertake extensive migrations out to sea to feed before returning to “home” rivers to spawn. Spawning takes place in shallow excavations (redds), in shallow gravelly areas in clean rivers and streams. After a period of 1-6 years the young salmon migrate downstream to the sea as smolts. Salmon have a homing instinct and spawn in the river of their birth after 1-3 years in the sea. Atlantic salmon leave their home rivers in spring and early summer as smolts, and migrate towards feeding areas in the Nordic Seas and West Greenland. Malcolm *et al.* (2010) noted that there is a general lack of data with regard to post-smolt migrations in the UK generally and in Scotland, though present observations of Atlantic salmon post-smolt activity revealed swimming depths of 1-3m, but up to 6m. Studies of adult salmon show a high degree of variability in behaviour, with individuals spending variable amounts of time between the surface and ~40m depth, with occasional dives. More generally it appears that they typically spend most of their time close to the surface, punctuated by deep dives.

Salmonids play a critical role in the life cycle of the freshwater pearl mussel *Margaritifera margaritifera*. The freshwater pearl mussel is long lived with records of individuals over 100 years old (Bauer 1992). The larval stage (or glochidia) of the mussel is inhaled by juvenile Atlantic salmon and brown or sea trout where it attaches to the gills and encysts. Encysted larvae live and grow in the hyper-oxygenated environment on the gills before dropping off in the following spring. Those sites designated for freshwater pearl mussel which are closest to the Blocks (minimum 220km) are Foinaven, the River Borgie and the River Naver.

The likelihood of a large oil spill is extremely low (blowout occurrence frequency in the range of 1/1,000-10,000 well years, see Section 7.2). The proposed work programme includes a contingent well. Therefore, unless drilling cannot be undertaken due to, for instance, the requirement to obtain more information (e.g. through additional seismic survey), a well will be drilled in one of the licence application Blocks. The potential for spills to cause deterioration of

supporting habitats or significant disturbance of migratory fish (e.g. from spill response activities) will be determined by the location, nature and timing of activities which are currently unknown (Note: oil spills are an accidental event and not a planned activity). Therefore, a detailed assessment of the potential for effects of a particular operation cannot be made at this time, but would be required subsequently, as part of project-level EIA. Where relevant, an HRA may also be undertaken for the proposed operations.

Following licensing, specific exploration drilling activities require permitting (see Figure 2.2) and those considered to present a risk to relevant sites and species would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are required of operators and monitored by the regulator for offshore exploration and production (Section 7.4). Detailed potential effects of such a release on Natura 2000 sites would be considered at the project level.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of a well, will not have an adverse effect on the integrity of the riverine SACs listed in Table 7.3.

7.3.3 Special Protection Areas

Table 7.4 provides information on those SPA types which are potentially vulnerable to oil spills. Those sites where the potential for effects from fuel and/or crude oil spills has been identified (see Appendix B) are listed. The relevant Blocks from which spills could theoretically affect the sites are also listed although for the purpose of the AA, are based on proximity to the sites and the nature of the qualifying features rather than detailed oil spill modelling. A full impact assessment of the proposed activities must be provided at the project level and (where relevant) an HRA would be undertaken. In addition, an oil pollution emergency plan (OPEP) must be in place before exploration and appraisal drilling activities are permitted. Based on information available on the foraging of seabirds (e.g. Thaxter *et al*. 2012, see Section 7.3.3.1 below), where relevant an attempt has been made to identify the qualifying feature from each SPA site that has the greatest mean maximum foraging range and identify those Blocks which fall within that range (e.g. of the qualifying features of the Sumburgh Head SPA, it was estimated that guillemot (part of the assemblage qualification) had the greatest foraging range (84±50km, from Thaxter *et al*. 2012). Of the West of Shetland Blocks, only 206/14 fell within this range from the Sumburgh Head SPA site). Thereby providing a very basic assessment of which protected species and sites may be potentially at risk from a spill within that Block. Note: several sites are represented in more than one risk category.

Table 7.4: SPA types potentially vulnerable to oil spills

Cliff-breeding seabird colonies
Designated for colonial breeding seabirds (including auks, fulmar, kittiwake, cormorant, and gannet, although due to their wide range foraging, gannets and fulmar are described separately below) which nest either on, or generally associated with sea cliffs. Birds utilise adjacent coastal waters for a variety of activities, and also forage beyond site boundaries. Seabirds feeding or resting on the sea surface are vulnerable to surface pollution, particularly during the breeding season when large numbers of birds are aggregated inshore, and for species of auk, during the autumnal moult, when gatherings of flightless birds form rafts on the water (see Section 7.2.3). **Sites potentially at risk (Blocks from which an oil spill could directly impact site):** Block 206/14: Sumburgh Head SPA, Foula SPA, Noss SPA, Fair Isle SPA, Marwick Head SPA,

Rousay SPA, West Westray SPA, Calf of Eday SPA, Copinsay SPA, Sule Skerry and Sule Stack SPA
Block 206/10b: Hermaness, Saxa Vord and Valla Field SPA

Sites potentially at risk (Blocks within which an oil spill could theoretically impact foraging qualifying species from a relevant site*):
Block 206/14: Sumburgh Head SPA (guillemot), Fair Isle SPA (puffin)
All Blocks: Foula SPA (puffin), Hermaness, Saxa Vord and Valla Field SPA (puffin), Noss SPA (puffin)

Petrel, tern, skua or gull breeding populations

Designated for breeding seabirds, which generally forage over sea areas adjacent to (or in some cases at considerable distance from) breeding sites.

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
Block 206/14: Sumburgh Head SPA, Foula SPA, Papa Stour SPA, Noss SPA, Mousa SPA, Fair Isle SPA, Rousay SPA, West Westray SPA, Papa Westray (North Hill and Holm) SPA, Calf of Eday SPA, Auskerry SPA, Copinsay SPA, Sule Skerry and Sule Stack SPA
Block 206/10b: Ronas Hill-North Roe and Tingon SPA, Ramna Stacks and Gruney SPA, Hermaness, Saxa Vord and Valla Field SPA, Fetlar SPA

Sites potentially at risk (Blocks within which an oil spill could theoretically impact foraging qualifying species from a relevant site*):
All Blocks: Foula SPA (Leach's storm petrel), Ramna Stacks and Gruney SPA (Leach's storm petrel), Fetlar SPA (Arctic skua)

Foraging gannets and fulmars

Gannets and fulmars are wide-ranging birds, with mean maximum foraging distances of 229km up to a maximum of 590km recorded in gannet* and 400km up to 580km recorded in fulmar* - foraging ranges which potentially brings birds from various colonies into contact with Blocks throughout UK waters. Work carried out studying the tracks of birds originating from each of the main gannet colonies around the UK coast suggest there is spatial segregation between foraging areas (Wakefield *et al.* 2013). Therefore, although some blocks may be comfortably within range of foraging gannets, there may be little or no evidence to suggest that birds from these colonies forage in the area. There is less information to describe foraging habits of fulmars.

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
Block 206/14: Noss SPA, Fair Isle SPA, Sule Skerry and Sule Stack SPA, Noss SPA, Fair Isle SPA, Sule Skerry and Sule Stack SPA, Sumburgh Head SPA, Foula SPA, Rousay SPA, West Westray SPA, Calf of Eday SPA, Copinsay SPA
Block 206/10b: Hermaness, Saxa Vord and Valla Field SPA, Fetlar SPA

Sites potentially at risk (Blocks within which an oil spill could theoretically impact foraging qualifying species from a relevant site*):
All Blocks: Hermaness, Saxa Vord and Valla Field SPA (gannet, fulmar), Noss SPA (gannet, fulmar), Fair Isle SPA (gannet, fulmar), Sule Skerry and Sule Stack SPA (gannet), Sumburgh Head SPA (fulmar), Foula SPA (fulmar), Hermaness, Saxa Vord and Valla Field SPA (fulmar), Fetlar SPA (fulmar), Rousay SPA (fulmar), West Westray SPA (fulmar), Calf of Eday SPA (fulmar), Copinsay SPA (fulmar)

Red-throated diver breeding populations utilising coastal waters

Inland sites designated for breeding red-throated diver (*Gavia stellata*) which forage in neighbouring coastal waters.

Sites potentially at risk (Blocks from which an oil spill could directly impact site):
Block 206/14: Foula SPA, Orkney Mainland Moors SPA
Block 206/10b: Ronas Hill-North Roe and Tingon SPA, Otterswick and Graveland SPA

Open coastline supporting wintering waders and seaduck

Contain coastal and intertidal habitats which support a variety of wintering waders and seaduck, often

in large aggregations. The birds feed on wetlands and the surrounding shallow waters. Seaduck form non-breeding concentrations in certain shallow coastal areas, spending most of the time on the water, diving in shallow areas for bivalve shellfish, and are therefore very vulnerable to oil spills (Law *et al.* 2011). **Sites potentially at risk (Blocks from which an oil spill could directly impact site):** Block 206/14: East Sanday Coast SPA
Firths, lochs and estuaries supporting breeding waders
Contain enclosed and semi-enclosed coastal and intertidal habitats (particularly wetlands) supporting a variety of breeding waders, often in large aggregations. Some species (e.g. seaducks) feed beyond the boundaries of sites. Waders appear to have a relatively low vulnerability to the direct effects of oil spills. The primary concern for waders during oil spills is the effects of the oil and the clean-up on their feeding and roosting resources. Avoidance of oiled sediment flats, which can be exacerbated by disturbance from clean-up activity, drives the birds away to find feeding and roosting areas elsewhere (Law *et al.* 2011). **Sites potentially at risk (Blocks from which an oil spill could directly impact site):** Block 206/14: Papa Stour SPA Block 206/10b: Fetlar SPA

*Note: *Block is within the mean maximum foraging range of a qualifying feature (listed in brackets, after Thaxter et al. 2012), which relates to a site considered in this AA. Therefore an oil spill in the block could in theory adversely affect site integrity through impacting qualifying features from the site foraging within the block.*

7.3.3.1 Consideration

The qualifying features of the sites listed in Table 7.4 are potentially vulnerable to a large oil spill due to both coastal and wider foraging, and for some species, time spent at the sea surface (see Section 7.2) which could result in significant disturbance to species. Additionally, such a large spill could result in damage to supporting habitats including intertidal areas utilised by a variety of wintering waterfowl and waders.

As referred to in Table 7.4 above, Thaxter *et al.* (2012) reviewed available information on seabird foraging ranges. As noted by the authors, the use of species-specific foraging ranges is subject to some error, for instance through density-dependent effects (e.g. Lewis *et al*. 2001), annual and inter-annual variation in foraging behaviour (e.g. Hamer *et al.* 2007), or simply differences in marine systems. Caution is therefore needed when using limited foraging range data, for example from a single breeding season or location, to provide ‘‘representative’’ foraging range information. The foraging distances presented in Thaxter *et al.* (2012) provide an indication of the range within which protected species and sites may be potentially at risk.

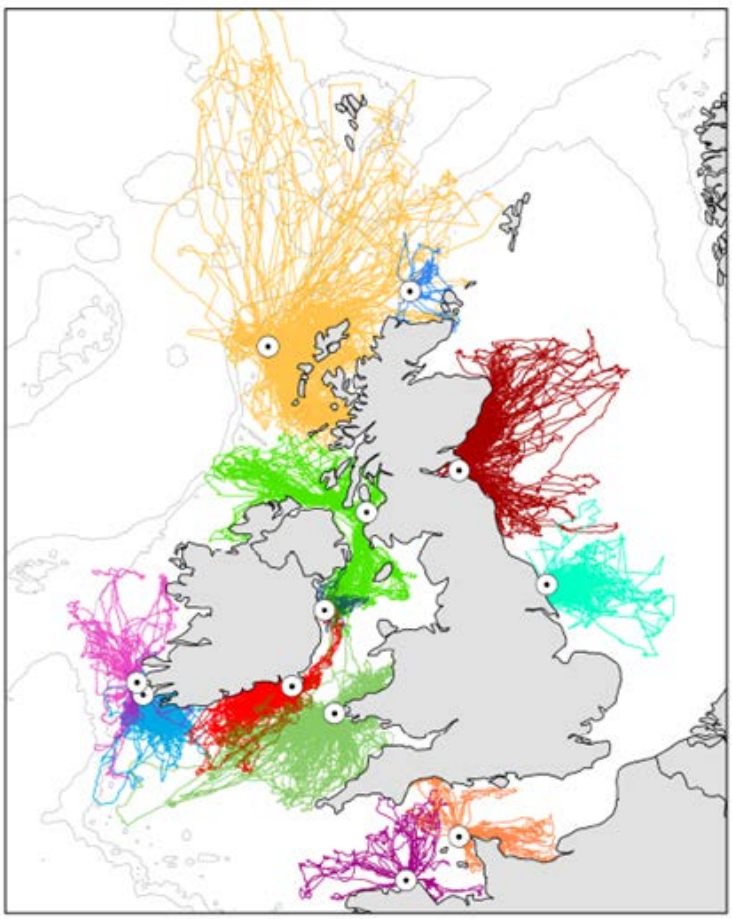
With respect to gannet foraging, tracking data from Wakefield *et al*. (2013) indicated that gannets from St. Kilda SPA (21 birds tagged in 2010) may forage over the West of Shetland Blocks (Figure 7.2). No gannets from colonies on Shetland were tagged as part of the study.

Important areas of seabird activity, outside designated, protected sites have been identified around the UK coast as part of an ongoing process to identify possible marine SPAs for seabirds (Kober *et al.* 2010, 2012). From Figure 7.3, seabirds likely to be present in important numbers over or close to some of the Blocks include breeding great skua (May-August) and

puffin (April-June)[35]. These birds may be associated with coastal breeding sites on Shetland including Hermaness, Saxa Vord and Valla Field SPA and Foula SPA, both of which include the species as qualifying features.

Bird species congregating in these areas will be vulnerable to surface pollution from an accidental spill in any of the Blocks. Offshore Vulnerability Index (OVI) values, for the Blocks are high to moderate overall but vary throughout the year with values during the breeding periods indicated in Table 7.5 varying between low (August) and very high (July) (Table 7.2).

Figure 7.2: Satellite tracks from gannets from main UK colonies



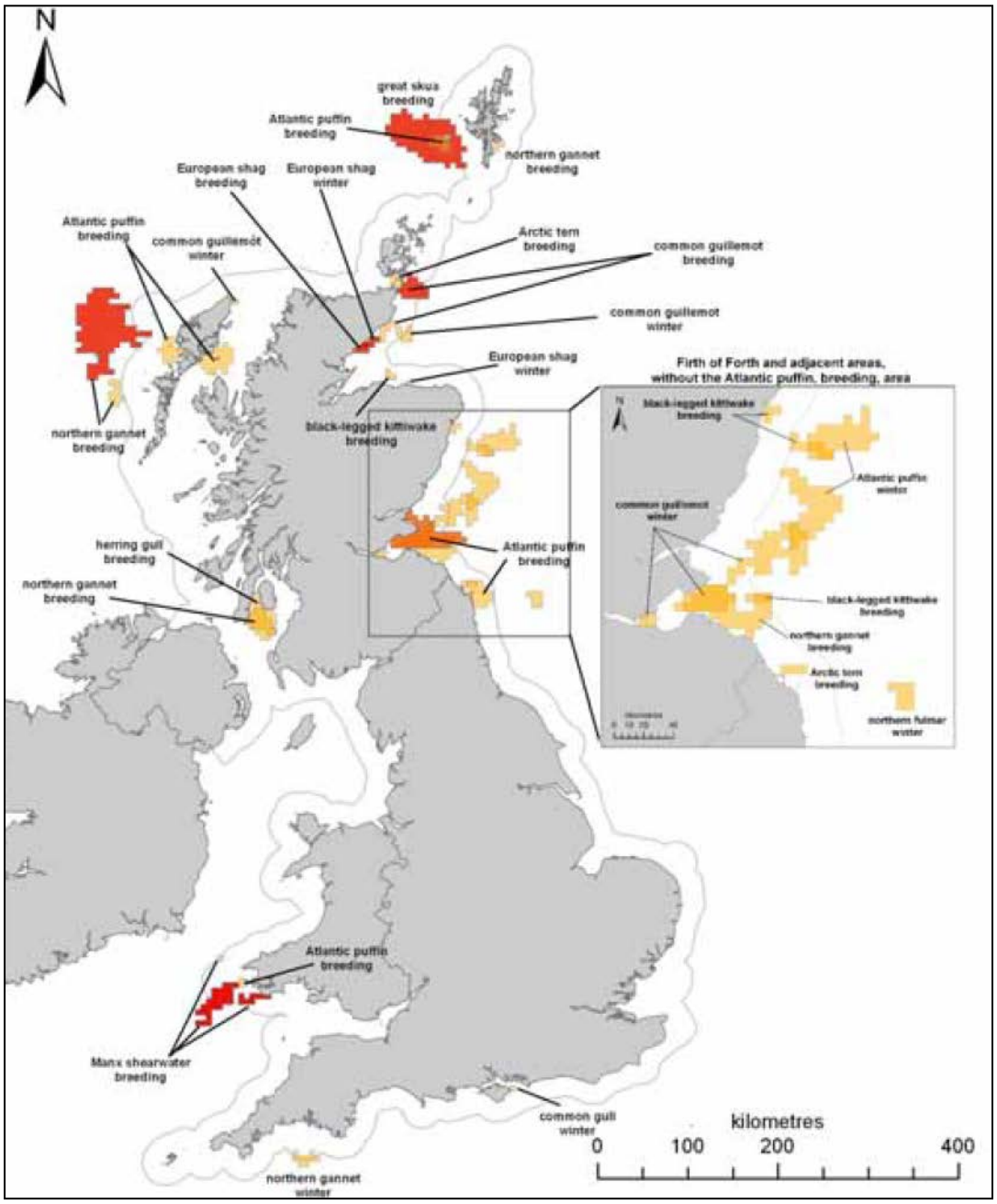
Source: Wakefield et al. (2013).

The likelihood of a large oil spill is extremely low (blowout occurrence frequency in the range of 1/1,000-10,000 well years, see Section 7.2). The proposed work programme indicates a contingent well. The potential to cause deterioration of the habitats of SPA qualifying species or

[35] Hotspots were identified using statistically derived threshold levels of abundance, and the application of UK SPA selection Stages 1.1-1.3. The guidelines were applied to assess whether species fulfilled the guidelines of regular occurrence and meeting a 1% minimum population threshold (Kober *et al.* 2010). This resulted in the identification of a restricted number of locations for a small number of species, addressing only part of their annual life-cycle; hence a second series of analyses was carried out to identify additional areas that might be considered under Stage 1.4 of the UK selection guidelines (Kober *et al*. 2010). This second analysis identified an additional suite of 29 areas. The full application of Stage 1.4 of the UK SPA selection guidelines will involve the evaluation of these additional areas based on ecological criteria outlined in Stage 2 of the guidelines, e.g. population size and density, species range, multi-species areas, etc (Kober *et al*. 2012).

significant disturbance to birds (e.g. from spill response activities) will be determined by the location, nature and timing of activities which are currently unknown (Note: oil spills are an accidental event and not a planned activity). Therefore, a detailed assessment of the potential for effects of a particular operation cannot be made at this time, but would be required subsequently, as part of project-level EIA. Where relevant, an HRA may also be undertaken for the proposed operations.

Figure 7.3: Important seabird areas around the UK



Source: Kober et al. (2012)

Following licensing, specific exploration drilling activities require permitting (see Figure 2.2) and those considered to present a risk to relevant sites would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are

required of operators and monitored by the regulator for offshore exploration and production (Section 7.4). Detailed potential effects of such a release on Natura 2000 sites would be considered at the project level.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of a well, will not have an adverse effect on the integrity of SPAs considered in this AA.

7.4 Regulation and mitigation

Spill prevention and mitigation measures are implemented for offshore exploration and production inter alia through the *Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation) Regulations 1998* and the *Offshore Installations (Emergency Pollution Control) Regulations 2002*. The required measures include spill prevention and containment measures, risk assessment and contingency planning. Under the Regulations, all operators of an offshore installation or oil handling facility must have an Oil Pollution Emergency Plan (OPEP) in place. The plans are reviewed by DECC, MCA and relevant environmental consultees, such as the relevant Devolved Authority (e.g. Marine Scotland), the Joint Nature Conservation Committee, the relevant inshore statutory nature conservation body, e.g. Scottish Natural Heritage, and other relevant organisations. An OPEP will only be approved following consultation and satisfactory operator response to any comments. Approval of an OPEP does not constitute approval of the operations covered by the plan. Operators are responsible for ensuring compliance with all other regulatory requirements. OPEPs set out the arrangements for responding to incidents with the potential to cause marine pollution by oil, with a view to preventing such pollution or reducing or minimising its effect. Additional conditions can be imposed by DECC, through block-specific licence conditions (i.e. "Essential Elements"). Operators are required to follow international and UK best practice when responding to oil spills (i.e. consistent with DECC's OPEP requirements) and must have in place the capability to employ response strategies for a spill of any severity. The minimum requirements for a response to spills of various sizes are shown in Table 7.5.

Table 7.5: Guidance on minimum standards required for oil pollution incident response

Estimated Oil Quantity (tonnes)	Dispersant combat rate (tonnes/hr)	Oil Type[1]	Aerial Surveillance Capability	Response Times	
				For Block Specific Vulnerability[2] of 1 (very high)	All other Vulnerability Categories (low to high)
0 to 25	10	2; 3 and 4	Within 4 hours	Monitor and dispersant within 1 hour	Monitor and dispersant available but no "within 1 hour requirement"
25 to 100		2, 3 and 4		Monitor and dispersant within 2 hours	Monitor and dispersant available but no "within 2 hour requirement"
100 to 500	50	2; 3 and 4		Monitor and dispersant within 6 hours	Monitor and dispersant within 6 hours
>500	>50	2; 3 and 4		Monitor and dispersant within 18 hours	Monitor and dispersant within 18 hours

Notes: [1]Oil type based on ITOPF groups, [2] based on JNCC (1999), see Table 7.2)
Source: DECC OPEP Guidance, July 2012

Activity level management measures (e.g. which should be implemented through an accredited Environmental Management System) can help to reduce the potential for spills of oil and chemicals of all sizes through, for instance, inventories of environmentally critical equipment, related maintenance schedules, training and good practice. Dependent on the activity being undertaken, DECC inspectors at the permitting stage, and on occasions prior to operations taking place, may conduct an onshore and/or offshore inspection of the installation to ensure that crews are aware of procedures in place to prevent spills and their responsibilities in spill prevention and reporting. Offshore, primary responsibility for oil spill response lies with the relevant Operator and their third party accredited pollution responders, although the Secretary of State's Representative may intervene if necessary. The MCA is responsible for a National Contingency Plan and maintains a contractual arrangement for provision of aerial spraying, with aircraft based at East Midlands and if necessary, Inverness. Within two days, aircraft can deliver sufficient dispersant to treat a 16,000 tonne spill within 50 miles of the coast anywhere around the UK. MCA holds 1,400 tonnes of dispersant stockpiled in 14 locations around the UK, in addition to counter-pollution equipment (booms, adsorbents etc.) which can be mobilised within 2-12 hours depending on incident location. The UK Government announced in 2012 that an Emergency Towing Vessel for the waters around the Northern and Western Isles will be stationed in Orkney up to 2015[36]. The government has also been in discussions with the oil industry on the potential of a commercial call-out arrangement to use their vessels[37] and BP have recently agreed to volunteer a vessel to help in an emergency should the MCA deem it appropriate[38].

For activities in proximity to sensitive shorelines, the Department's guidance (DECC 2012b) requires that the risk of shoreline contamination be determined through an appropriate risk assessment, and operators with oil spill scenarios that could impact the shoreline must have access to appropriate oil spill response resources suitable for shoreline clean-up operations. Additional resources are required for installations operating in any Block wholly or partly within 25 miles of the coastline dependent on the hydrocarbon inventory and the oil pollution incident scenarios identified, including:

- The presence near the facility at all times of a vessel:
    - with the capability of spraying dispersant within 30 minutes of an oil pollution incident notification
    - has a stock of dispersant sufficient to deal with an oil pollution incident of 25 tonnes, and if required, have the capability (equipment and capacity) of recovering any oil likely to be lost from the installation under a Tier 1[39] scenario

[36] Orkney Islands Council website - http://www.orkney.gov.uk/OIC-News/emergency-vessel-to-be-stationed-in-orkney.htm
[37] Scotland Office website - http://www.scotlandoffice.gov.uk/scotlandoffice/17322.html
[38] https://www.gov.uk/government/news/moore-welcomes-bp-and-north-star-support-for-second-support-vessel\
[39] Oil pollution incidents are classified according to the response levels they are most likely to require and not the volume of oil pollution, unless this is supported by a location specific risk assessment. For example, if a pollution incident requires the use of resources from a regional centre, this would be used to classify the necessary response level, irrespective of its size.
For consistency with the National Contingency Plan, the following Tier definitions apply:
- Tier 1 Local (within the capability of the operator on site);
- Tier 2 Regional (beyond the in-house capability of the operator);
- Tier 3 National (requiring national resources).

- In the event of a Tier 2 incident, Tier 2 resources must be available on scene within half the time taken for the oil to reach shore in 30 knot wind conditions

- Details of resources to deal with a Tier 3 incident (i.e. an oil pollution incident that cannot be controlled by Tier 1 or 2 resources), including sources transport and delivery system

- A Shoreline Protection Strategy Plan

UK oil spill contingency planning and response capabilities have been reviewed and revised following the Deepwater Horizon spill (see Section 7.1). Oil & Gas UK established the Oil Spill Prevention and Response Advisory Group (OSPRAG) to provide a focal point for the sector's review of the industry's practices in the UK, in advance of the conclusion of investigations into the Gulf of Mexico incident. OSPRAG's work is documented in their final report, *Strengthening UK Prevention and Response*, published September 2011 and the Secretary of State is examining its findings closely.

In relation to OPEP's, the assessment and approval process and the toolkit of response measures which UKCS operators can draw upon have been strengthened by a more robust approach to oil spill trajectory modelling which includes worst case scenario planning and the availability of the new OSPRAG capping device which is now ready for deployment. The Oil Spill & Emergency Response Review Group (OSERRG) also recommended that a new forum, the Oil Spill Response Forum (OSRF), be set up to 'further develop and maintain an effective, robust and sustainable oil spill response capability for upstream operations on the UKCS'. This includes workgroups on oil pollution emergency planning, subsea dispersant injection, shoreline response and science and new technology.

OSPRAG's technical review group reviewed the UK offshore oil and gas industry's practices in the following areas: well examination verification and primary well control, blowout preventers (BOPs) and competency, behaviours and human factors. This work concluded that there is a high degree of confidence in the UK regulatory regime and that it drives the right safety and environmental behaviours. The Well Life Cycle Practices Forum (WLCPF) will advance recommendations made by OSPRAG and facilitate the dissemination of lessons from Macondo and other similar events, with a specific focus (among others) on BOP issues, including liaison with the HSE on the recommendation made by the House of Commons Select Committee that it examines the case for prescribing the equipment of BOPs on the UKCS with two blind shear rams.

In addition to loss of well control, risk of oil and diesel loss resulting from collision is considered for drilling activities. A consent to locate a drilling rig is required in advance of drilling (see Figure 2.2), which is subject to consultation with relevant stakeholders (e.g. the MCA, MoD). Such consent requires vessel traffic surveys and a collision risk assessment, and requires the movement and location of the rig to be notified to other users of the sea (e.g. through notices to mariners). A statutory 500m safety zone is established around the rig when in the field, and a standby and/or guard vessel is also located next to the rig during drilling operations to ensure that vessels do not enter the safety zone, and to provide emergency response.

Whilst the indemnity and insurance group of OSPRAG concluded that the current Offshore Pollution Liability Association Limited (OPOL) level of US $250 million is appropriate in the majority of scenarios, in certain limited cases spill clean up and compensation costs could result in claims above this limit. Guidance issued by Oil & Gas UK (OGUK) in November 2012 outlines a new process by which operators assess the potential cost of well control, pollution

remediation and compensation, with a subsequent requirement to demonstrate to DECC financial capability to address these potential consequences. DECC released a guidance note to industry[40] effective from January 1st 2013 on the demonstration of financial responsibility before consent may be granted for exploration and appraisal wells. It was noted in this document that, though not constituting DECC guidance, considerable weight would be given to operators who can show that they have met the criteria set out in the OGUK guidance. DECC require that an operator must demonstrate the cost of well control and the cost of financial remediation and compensation from pollution at the time of OPEP submission, and verify this responsibility by, for instance: insurance, parent company guarantee, reliance on credit/financial strength rating of the operator.

7.5 Conclusions

Individual relevant sites have been categorised in terms of potential vulnerability, based on location in relation to known hydrocarbon prospectivity of the proposed licence Blocks (currently unknown but assumed to be oil as worst case in terms of potential spill impacts) and therefore the nature and magnitude of credible risks. Two categories of vulnerability were identified:

- Those sites considered to be at potential risk (see Tables 7.3 and 7.4 including relevant qualifying features foraging outside of sites), with the possibility of impacts in the event of a significant spill of crude oil, bunker or lube oil (i.e. where site conservation objectives are at risk of being undermined).

- Many sites are considered not to be at risk from oil spills associated with activities in the Blocks, due to their distance from the Blocks and relative sensitivity of the features.

The incremental risk associated with activities resulting from the proposed licensing (i.e. additional to existing risk; primarily associated with shipping and other maritime activities) is low. This results from the combination of low probability and low severity (since most spills would be small in volume). The overall risks of a major crude oil spill, which would require catastrophic loss of well control, are quantitatively and qualitatively comparable to those considered ALARP (As Low As Reasonably Practicable) under the relevant UK health and safety regulations. The activities which could reasonably be expected to follow from the proposed licensing would not have a significant effect on the existing risks associated with other activities (see Section 8 for in-combination effects).

Oil spills can have potentially adverse effects, and are controlled in direct proportion to this by a legal framework that minimises their occurrence, provides for contingency planning, response and clean up, and which creates an offence of such spills to enable prosecutions. It is not possible to say that in spite of the regulatory controls and other preventative measures, an oil spill will never occur as a result of activities which may follow licensing; however, as oil spills are not intended or planned activities, a risk-based assessment is appropriate.

Following licensing, specific exploration drilling activities require permitting (see section above, Figure 2.2) and those considered to present a risk to relevant sites would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially

[40] DECC Guidance Note To UK Offshore Oil and Gas Operators On The Demonstration Of Financial Responsibility Before Consent May Be Granted for Exploration and Appraisal Wells On The UKCS (December 2012).

consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are required of operators and monitored by the regulator for offshore exploration and production.

Given the availability of prevention and mitigation measures which are applied prior to consenting any activity including project specific safety, oil spill risk assessment, response, inspection and other monitoring, and the requirement for project specific HRA, DECC considers that the granting of a licence (or licences) for Blocks 206/9b, 206/10b and 206/14 would not adversely affect the integrity of relevant sites.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of a well, will not adversely affect the integrity of Natura 2000 sites.

8 In-combination effects

Potential incremental, cumulative, synergistic and secondary effects from a range of operations, discharges, emissions (including noise), and accidents were considered in the Offshore Energy SEAs (DECC 2009, 2011; see also OSPAR 2000, 2010). The Scottish National Marine Plan is out to consultation, and will set out the strategic objectives for the Scottish marine area including important marine activities such as renewable energy, aquaculture, conservation, recreation and tourism, ports, harbours and shipping. In order to take forward the objectives of the National Plan, smaller Scottish Marine Regions (SMRs) will allow planning to take place at a local level. The identification of these Scottish Marine Regions was subject to consultation in 2012[41].

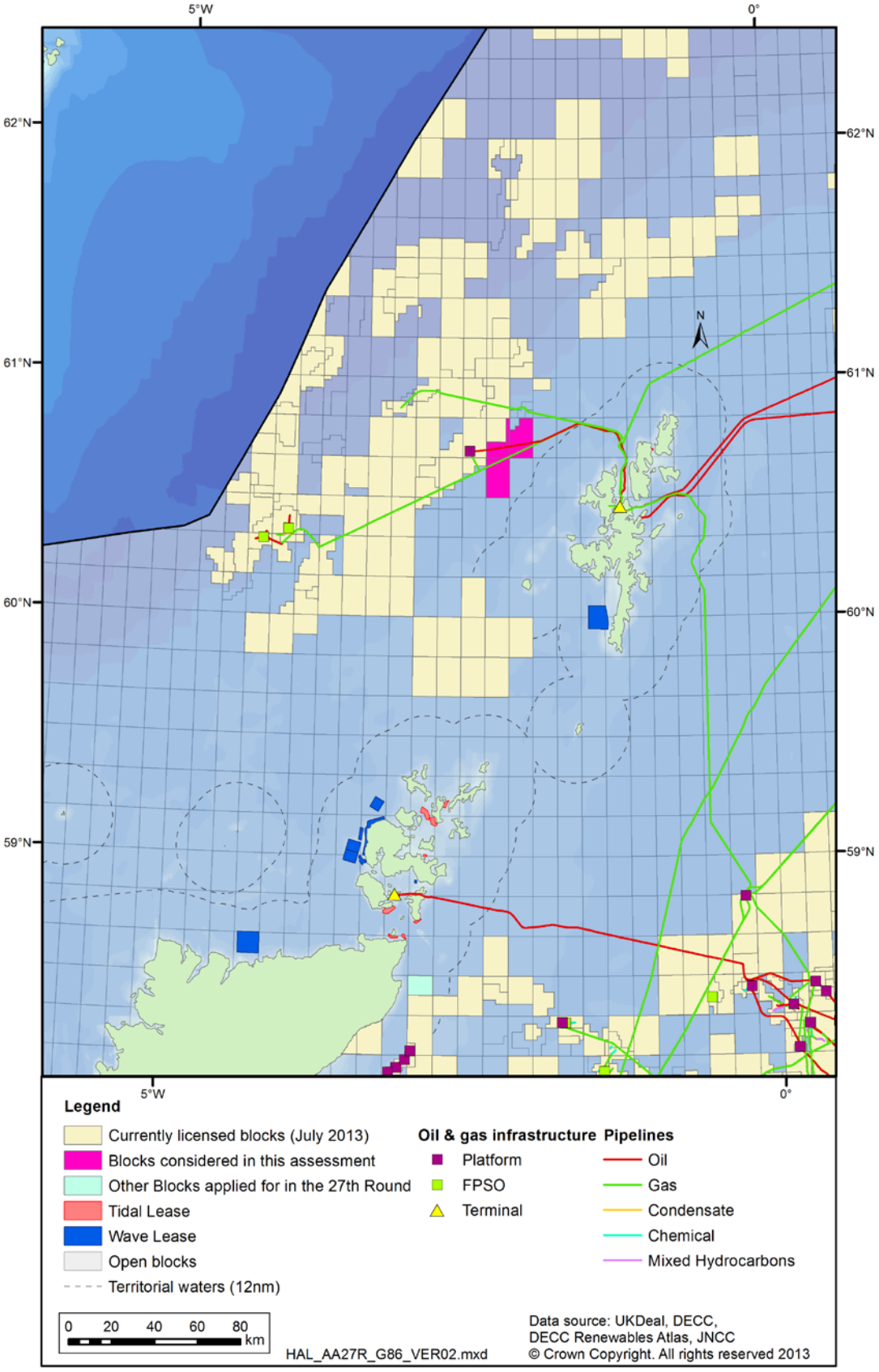
8.1 Underwater Noise

Seismic survey and other noise producing activities that might follow the proposed licensing are anticipated to be widely separated in space and time. Therefore, any acoustic disturbance to marine mammals with the potential to cause displacement from foraging areas will be short-term and infrequent, and are relevant to sites including Faray and Holm of Faray SAC, Sanday SAC, Mousa SAC and North Rona SAC, which have populations of harbour or grey seal which forage widely in the area. SMRU (2007) note that "The effects of repeated surveys are not known, but insignificant transient effects may become important if potentially disturbing activities are repeated and/or intensified." There is the potential for cumulative noise impacts where concurrent and sequential activities result in long-term exposure to elevated noise levels within the wider area. However, the likelihood of this is low (because of technical interference) and subject to mitigation in the near future by measures introduced to achieve Good Environmental Status under the Marine Strategy Framework Directive.

Other noise producing activities which are likely to occur within the region include those associated with the development of marine renewable energy (e.g. see Marine Scotland 2010). The Pentland Firth and waters surrounding Orkney are of considerable interest for the development of wave and tidal energy devices. The Crown Estate have identified Scottish territorial waters along the north coast of mainland Scotland and around Orkney as a potential area for wave and tidal energy development and held a leasing competition in the Pentland Firth strategic area in September 2008. Negotiations with preferred bidders were concluded in March 2010, and agreements for lease were entered into for six wave project development sites and four tidal stream sites (Figure 8.1). The total potential capacity of these sites was 1,600 MW, half of which was for the wave projects and the other half for the tidal. 9 of the projects are currently in the development stage, with a further 2 in the detailed planning stage. Consenting of any such developments will be subject to the conclusions of project-specific EIA and HRA.

[41] Scottish Government (2012). Consultation on The Draft Scottish Marine Regions Order 2013.

Figure 8.1: Relevant marine renewable energy and existing oil and gas development in the area



The Scottish Government has released Regional Locational Guidance (RLG) for offshore renewable energy developments in Scottish waters (September 2010) which provides non-

statutory guidance and information on the opportunities for, and key considerations influencing the siting and consenting of offshore renewable energy developments including the area to the west of Shetland, identified for possible wave energy projects. The guidance was the result of work by the Scottish Government and The Crown Estate to help inform a further leasing round for offshore wave and tidal energy, and to assist in the Saltire Prize competition. Additionally, the area has been subject to the first stage in developing a Marine Spatial Plan (MSP) which builds on the work of the RLG. This consists of a review of baseline material, the identification of data gaps and recommendations on how these should be filled.

The closest wave or tidal development, the Aegir Shetland wave farm, is 62km from the West of Shetland Blocks under consideration (206/14), reducing the likelihood of significant in combination effects with Block activities.

In relation to offshore pile-driving, standard conditions on consents for Round 2 offshore wind farms (and anticipated Round 3 zones) include various protocols to minimise the potential for acoustic disturbance of marine life, including the use of soft start, MMOs and PAM. For future developments, additional measures are likely to be required in areas where EIA suggests that high cetacean densities or site fidelity may occur; these may include technical measures such as pile sleeves (see Nehls *et al*. 2007). The "Statutory nature conservation agency protocol for minimising the risk of disturbance and injury to marine mammals from piling noise" (JNCC 2010a) outlines a protocol for the mitigation of potential underwater noise impacts arising from pile driving during offshore wind farm construction. SNH may in the future produce similar guidance in respect of Scottish territorial waters.

In addition to those activities which may follow licensing of the West of Shetland Blocks and future marine renewable energy development, there are a variety of other existing (e.g. oil and gas production (see Figure 8.1), fishing, shipping and military exercise areas) and planned (e.g. oil and gas exploration and production) noise-producing activities in overlapping or adjacent areas. Despite this, DECC is not aware of any projects or activities which are likely to cause cumulative or synergistic effects that, when taken in-combination with the likely number and scale of activities proposed by the work programme (see Section 2.2), would adversely affect the integrity of the relevant sites. This is due to the presence of effective regulatory mechanisms which ensure that operators, DECC and other relevant consenting authorities take such considerations into account during activity permitting. These mechanisms generally allow for public participation in the process, and this will be strengthened by regulations amending the offshore EIA regime which are due to come into force later this year. In respect of oil and gas activities and other developments with the potential to affect Natura 2000 sites, these mechanisms also include project specific Habitats Regulations Assessments.

The Marine Strategy Framework Directive (2008/56/EC) (MSFD) requires that the European Commission establish criteria and methodological standards to allow consistency in approach in evaluating the extent to which Good Environmental Status (GES) is being achieved. Task Group 11 reported on underwater noise and other forms of energy (though note that at present only noise is considered), and developed three possible indicators of underwater sound (Tasker *et al*. 2010). In no case was the Task Group able to define precisely (or even loosely) when GES occurs on the axes of these indicators. This is partly to do with insufficient evidence and recognised scientific challenges but also to no fully accepted definition of when, for example, a behavioural change in an organism is not good. The EC decided in 2010 that guidance was needed to help member states implement the indicators. Established in 2010, the Technical Sub Group Noise focussed on clarifying the purpose, use and limitation of the indicators and described methodology that would be unambiguous, effective and practicable (Van der Graaf *et al.* 2012).

A UK Government consultation was undertaken on proposals for characteristics of GES for the UK's seas and for more detailed targets and indicators of GES (HM Government 2012a), and a Government response was published in December 2012[42]. The report recognises that there was insufficient data to provide a quantitative assessment of the current status and trends of underwater noise due to the lack of monitoring studies. However, increases in construction levels were likely to have contributed to localised increases in noise levels. The document indicates that further research, monitoring and investigation were necessary to fully understand the effects of noise at an individual and population level, the risks and significance of sound inputs to the environment, and appropriate options for mitigation. However, currently there is no evidence to suggest that current levels of noise in UK waters were having an impact at the population level on cetaceans or other noise sensitive animals (HM Government 2012a).

Following consultation a Government (HM Government 2012b) response defined the UK characteristics of Good Environmental Status for noise (covering impulsive sound, caused primarily by activities such as oil and gas seismic activity and pile driving for wind farms) as:

- Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems: Human activities potentially introducing loud, low and mid frequency impulsive sounds into the marine environment are managed to the extent that no significant long term adverse effects are incurred at the population level or specifically to vulnerable/threatened species and key functional groups. Continuous low frequency sound inputs do not pose a significant risk to marine life at the population level, or specifically to vulnerable/threatened species and key functional groups e.g. through the masking of biologically significant sounds and behavioural reactions.

It was recognised in the consultation document (HM Government 2012a) that setting a specific target representing GES was difficult, given current uncertainties. Due to the high level of uncertainty about the effects of noise, it has not been possible for experts to recommend a specific target for either impulsive sounds or ambient sounds which they believe to be equivalent to GES. Instead, an operational target has been developed for impulsive sounds and a surveillance indicator developed for ambient sounds (HM Government 2012b):

- To establish a 'noise registry' to record, assess and manage the distribution and timing of anthropogenic sound sources measured over the frequency band 10Hz to 10kHz, exceeding the energy source level 183 dB re 1 μPa^2 m^2s; or the zero to peak source level of 224 dB re 1 μPa^2 m^2 over the entire UK hydrocarbon licence block area.

- Surveillance indicator to monitor trends in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations.

It is anticipated that monitoring data arising from the latter ambient noise surveillance indicator will help to develop an appropriate target for 2018. The noise registry would likely be managed by JNCC and require a degree of coordination from regulating authorities around the UK. It would enable a better understanding of the potential for cumulative and in-combination effects,

[42] HM Government (2012b). Marine Strategy Part One: UK Initial Assessment and Good Environmental Status.

and allow for some adjustment in the scheduling of activities if it appeared significant adverse impacts may arise (HM Government 2012a, b).

DECC is cognisant of the ongoing efforts to determine an indicator, descriptor of good environmental status and targets for noise. DECC will review the results of the ongoing process closely with respect to the consenting of relevant activities which may result from future licensing, as well as other activities which generate noise in the marine environment.

8.2 Other potential in-combination effects

8.2.1 Physical damage/change to features and habitats

Potential sources of physical disturbance to the seabed, and damage to biotopes, associated with oil and gas activities were identified by the OESEA2 as anchoring of semi-submersible rigs; wellhead placement and recovery; production platform jacket installation and piling; subsea template and manifold installation and piling; pipeline, flowline and umbilical installation and trenching and decommissioning of infrastructure (DECC 2011), though the work programmes discussed would only entail rig siting, wellhead placement and recovery.

In general, cumulative effects are likely to be dominated by trawling, with potential scour and physical damage from cable laying within the area to the west of Shetland identified as of strategic relevance to wave energy development, however the scale and timing of any development in this area is unknown, and will be subject to further leasing arrangements and project level EIA and HRA if required. It is generally accepted that the principal source of human physical disturbance of the seabed and seabed features is bottom trawl fishing (Hall-Spencer *et al*. 2002). Trawl scarring is a major cause of concern with regard to conservation of shelf and slope habitats and species (e.g. Witbaard & Klein 1993, de Groot and Lindeboom 1994, Kaiser *et al*. 2002a, Kaiser *et al*. 2002b, Gage *et al*. 2005). The long-term effects of bottom fishing disturbance is less well understood due to the complex nature of the changes and the lack of pre-impact or control data (Frid *et al.* 2000, Bradshaw *et al.* 2002). Analysis of 101 experimental fishing impact studies undertaken by Kaiser *et al.* (2006) predicted recovery times in sand and gravel habitats after a scallop trawl as *ca.* 8 years; muddy sand as *ca.* 1.6 years and reef as *ca.* 3.2 years), with the scallop trawl being particular severe in terms of benthic disturbance (Mason 1983). Beam and otter trawling of sandy and muddy sediments exhibited a quicker recovery rate of the benthic species. However, the recovery rate of muddy sand after beam and otter trawl is still predicted at *ca.* 0.6-0.65 years respectively (Kaiser *et al.* 2006). Given the forecast scale of activity, it is likely that there will be considerable spatial and temporal separation between disturbance “footprints” and a low probability of incremental overlap of affected areas. Recovery of affected seabed through sediment mobility, and faunal recovery and recolonisation is expected to be rapid (less than five years) where the source of effects is transient (e.g. anchoring).

8.2.2 Physical presence

Physical presence of offshore infrastructure and support activities may also potentially cause behavioural responses in fish, birds and marine mammals. Previous SEAs have considered the majority of such behavioural responses resulting from interactions with offshore oil and gas infrastructure (whether positive or negative) to be insignificant; in part because the number of surface facilities is relatively small (of the order of a few hundred, and with just a few to the West of Shetland) and because the majority are at a substantial distance offshore.

The larger numbers of individual surface or submerged structures associated with offshore wind developments, the presence of rotating turbine blades and considerations of their location and

spatial distribution (e.g. in relation to coastal breeding or wintering locations for waterbirds and important areas for marine mammals), indicate a higher potential for physical presence effects. Potential displacement and barrier effects will likely be an important consideration at the project level for renewable energy projects in the Pentland Firth marine energy strategic area, or any leasing arising to the west of Shetland, and will likely form an important part of associated HRAs. All of the proposed Blocks are a considerable distance from any of the proposed wind farm or marine renewable energy zones or development locations, reducing the potential for in-combination effects.

Shipping density in the area has been classified by DECC as low to very low. Blocks 206/10 and 206/14 overlap IMO routeing areas to the west of Shetland though these are not designated traffic separation schemes or deep water navigation routes. Siting of rigs in this area would be subject to a consent to locate, and a vessel traffic survey and collision risk assessment would have to be undertaken before, in combination with other permits, drilling could be undertaken (see Figure 2.2).

8.2.3 Marine discharges

Previous discharges of WBM cuttings in the UKCS have been shown to disperse rapidly and to have minimal ecological effects (Section 5.3). Dispersion of further discharges of mud and cuttings could lead to localised accumulation in areas where reduced current allows the particles to accumulate on the seabed. However, in view of the scale of the proposed activity, extent of the region, the water depths and currents, this is considered unlikely to be detectable and to have negligible cumulative ecological effect (DECC 2011).

8.3 Conclusions

The competent authorities will assess the potential for in-combination effects during HRA of project specific consent applications; this process will ensure that mitigation measures are put in place to ensure that subsequent to licensing, specific projects (if consented) will not result in adverse effects on integrity of relevant sites. Therefore, bearing this in mind, it is concluded that the in-combination effects from activities arising from the licensing of Blocks 206/9b, 206/10b and 206/14 with those from existing and planned activities in the West of Shetland area will not adversely affect the integrity of the relevant sites.

9 Overall conclusion

Taking account of all the matters discussed, the Secretary of State is able to grant consent to the plan/programme (as defined) under the Habitats Directive and award the licences covering Blocks 206/9b, 206/10b and 206/14 (considered further in Sections 6-8). This is because there is certainty, within the meaning of the ECJ Judgment in the ***Waddenzee*** case, that implementation of the plan will not adversely affect the integrity of relevant European Sites, taking account of the mitigation measures that can be imposed through existing permitting mechanisms on the planning and conduct of activities.

These mitigation measures are incorporated in respect of habitat, diadromous fish, bird and marine mammal interest features through the range of legislation and guidance (see https://www.gov.uk/oil-and-gas-offshore-environmental-legislation and https://www.gov.uk/oil-and-gas-petroleum-operations-notices) which apply to developer activities which could follow plan adoption. Where necessary, project-specific HRA based on detailed project proposals would be undertaken by the competent authority before the granting of a permit/consent. The competent authority needs to be satisfied that the proposed activity will not result in adverse effects on integrity of relevant sites.

Even where a site/interest feature has been screened out in the plan level assessment, or where a conclusion of no adverse effect on integrity has been reached at plan level, project level HRA will be necessary if, for example, new relevant sites have been designated after the plan level assessment; new information emerges about the nature and sensitivities of interest features within sites, new information emerges about effects including in-combination effects; or if plan level assumptions have not been met at the project level.

10 References

André M, Solé M, Lenoir M, Durfort M, Quero C, Mas A, Lombarte A, van der Schaar M, López-Bejar M, Morell M, Zaugg S & Houégnigan L (2011). Low-frequency sounds induce acoustic trauma in cephalopods. *Frontiers in Ecology and the Environment* **9**: 489–493

Beatrice Offshore Wind (2012). Environmental Statement. Arcus Renewable Energy Consulting Ltd.

BERR (2008). Atlas of UK marine renewable energy resources. A Strategic Environmental Assessment Report. Produced by ABPmer, The Met Office and Proudman Oceanographic Laboratory.

Berrow S, Holmes B & Goold J (2002). The distribution and intensity of ambient and point source noises in the Shannon estuary. Final report to the Heritage Council. http://www.shannondolphins.ie/downloads/Berrow_SourceNoisesShannonEstuary.pdf

Bexton S, Thompson D, Brownlow A, Barley J, Milne R & Bidewell C (2012). Unusual mortality of pinnipeds in the United Kingdom associated with helical (corkscrew) injuries of anthropogenic origin. *Aquatic Mammals* **38**: 229-240.

Bradshaw C, Veale LO & Brand AR (2002). The role of scallop-dredge disturbance in long-term changes in Irish Sea benthic communities: a re-analysis of an historical dataset. *Journal of Sea Research* **47**: 161-184.

Brandt MJ, Diederichs A, Betke K & Nehls G (2011). Responses of harbour porpoises to pile driving at the Horns Rev II offshore wind farm in the Danish North Sea. *Marine Ecology Progress Series* **421**: 205–216.

Camphuysen CJ (2007). Chronic oil pollution in Europe: a status report. A report by the Royal Netherlands Institute for Sea Research for IFAW, 88pp.

Christian JR, Mathieu A, Thompson DH, White D & Buchanan RA (2003). Effect of seismic energy on snow crab (*Chionoecetes opilio*) 7th November 2003. Environmental Research Funds Report No. 144, Calgary, 106pp

Coyle MD & Wiggins SM (2010). European marine site risk review. Natural England Research Reports No. 38.

Cranmer G (1988). Environmental survey of the benthic sediments around three exploration well sites. Report No 88/02. Report to the United Kingdom Offshore Operators Association. Aberdeen University Marine Studies Ltd, Aberdeen, UK, 33pp.

Currie DR & Isaacs LR (2005). Impact of exploratory offshore drilling on benthic communities in the Minerva gas field, Port Campbell, Australia. *Marine Environmental Research* **59**: 217–233

Daan R & Mulder M (1996). On the short-term and long-term impact of drilling activities in the Dutch sector of the North Sea. *ICES Journal of Marine Science* **53**: 1036-1044.

Dähne M, Gilles A, Lucke K, Peschko V, Adler S, Krügel K, Sundermeyer J & Siebert U (2013). Effects of pile-driving on harbour porpoises (*Phocoena phocoena*) at the first offshore wind farm in Germany. *Environmental Research Letters* **8**: 025002, 16pp.

Davis RA, Richardson WW, Thiele L, Dietz R & Johansen P (1991). State of the Arctic Environment report on underwater noise. Arctic Center Publications 2, Finland special issue. *The State of The Arctic Environment Reports*: 154-269.

De Groot SJ & Lindeboom HJ (1994). Environmental impact of bottom gear on benthic fauna in relation to natural resources management and protection of the North Sea. NIOZ Rapport 1994-11, Texel, The Netherlands.

DECC (2009). Offshore Energy Strategic Environmental Assessment, Environmental Report. Department of Energy and Climate Change, UK, 307pp plus appendices. http://www.offshore-sea.org.uk/site/scripts/book_info.php?consultationID=16&bookID=11

DECC (2011). Offshore Energy Strategic Environmental Assessment 2, Environmental Report. Department of Energy and Climate Change, UK, 443pp plus appendices. http://www.offshore-sea.org.uk/site/scripts/book_info.php?consultationID=17&bookID=18

DECC (2012a). Offshore Oil & Gas Licensing: 27th Seaward Round. Habitats Regulation Assessment Phase 1 – Block Screening. URN 12D/288: October 2012, 19pp + appendices.

DECC (2012b). Guidance notes to operators of UK offshore oil and gas installations (including pipelines) on Oil Pollution Emergency Plan requirements, 58pp.

DECC (2012c). Elgin gas release, environmental aspects update. Government Interest Group, 16 May 2012.

Defra (2010). Charting Progress 2: An assessment of the state of UK seas. Published by the Department for Environment Food and Rural Affairs on behalf of the UK Marine Monitoring and Assessment Strategy community, London, 194pp.

Defra (2013). Report on the work of the Habitats and Wild Birds Directives – Marine Evidence Group, May 2013. Published by the Department of Environment, Food and Rural Affairs, 40pp.

Dernie KM, Kaiser MJ & Warwick RM (2003). Recovery rates of benthic communities following physical disturbance. *Journal of Animal Ecology*. **72**: 1043-1056.

DFO (2004). Potential impacts of seismic energy on snow crab. DFO (Fisheries and Ocean Canada) Canadian Science Advisory Secretariat. Habitat Status Report 2004/003

Dixon T (2012). Annual survey of reported discharges attributed to vessels and offshore oil and gas installations operating in the United Kingdom pollution control zone 2011. Advisory Committee on Protection of the Sea (ACOPS). 81pp.

Duck CD & Mackey BL (2008). Grey seal pup production in Britain in 2007. SCOS briefing paper

Duck CD (2009). Grey seal pup production in Britain in 2008. SCOS briefing paper

EC (2000) Managing NATURA 2000 Sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, 69pp.

Energy and Climate Change Committee (2011). Second report: UK deepwater drilling – Implications of the Gulf of Mexico spill. UK Government Select Committee report. http://www.publications.parliament.uk/pa/cm201011/cmselect/cmenergy/450/45002.htm

Engås A, Løkkeborg S, Ona E & Soldal AV (1996). Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). *Canadian Journal of Fisheries and Aquatic Sciences* **53**: 2238-2249.

Faber Maunsell & Metoc (2007). Marine renewables Strategic Environmental Assessment (SEA). Report to The Scottish Government. Faber Maunsell & Metoc, UK.

Foden J, Rogers SI & Jones AP (2009). Recovery rates of UK seabed habitats after cessation of aggregate extraction. *Marine Ecology Progress Series*. **390**: 15-26.

Frid CLJ, Harwood KG, Hall SJ & Hall JA (2000). Long-term changes in the benthic communities on North Sea fishing grounds. *ICES Journal of Marine Science* **57**: 1303-1309.

Gage JD, Roberts JM, Hartley JP & Humphery JD (2005). Potential impacts of deep-sea trawling on the benthic ecosystem along the northern European continental margin: a review. In: PW Barnes & JP Thomas Eds. *Benthic habitats and the effects of fishing*. American Fisheries Society, Symposium 41, Bethesda, Maryland. pp. 503-517.

Goold JC & Fish PJ (1998). Broadband spectra of seismic survey air-gun emissions, with reference to dolphin auditory thresholds. *Journal of Acoustical Society of America* **103**: April 1998

Goold JC (1996). Acoustic assessment of populations of common dolphin, *Delphinus delphis*, in conjunction with seismic surveying. *Journal of the Marine Biological Association of the UK* **76**: 811-820.

Gordon JCD, Gillespie D, Potter J, Frantzis A, Simmonds M & Swift R (1998). The effects of seismic surveys on marine mammals. In: ML Tasker & C Weir Eds. *Proceedings of the Seismic and Marine Mammals Workshop*, 23-25 June 1998, London.

Hall-Spencer J, Allain V & Fossa JH (2002). Trawling damage to Northeast Atlantic ancient coral reefs. *Proceedings of the Royal Society B: Biological Sciences* **269**: 507-511.

Hamer KC, Humphreys EM, Garthe S, Hennicke J, Peters G, Grémillet D, Phillips RA, Harris MP & Wanless S (2007). Annual variation in diets, feeding locations and foraging behaviour of gannets in the North Sea: flexibility, consistency and constraint. *Marine Ecology Progress Series* **338**: 295–305.

Hammond PS, Gordon JCD, Grellier K, Hall AJ, Northridge SP, Thompson D & Harwood J (2002). Background information on marine mammals relevant to Strategic Environmental Assessments 2 and 3. Sea Mammal Research Unit, 78pp.

Hammond PS, Northridge SP, Thompson D, Gordon JCD, Hall AJ, Duck CD, Aarts G, Cunningham L, Embling CB & Matthiopoulos J (2006). Background information on marine mammals for Strategic Environmental Assessment 7. Report to the DTI from Sea Mammal Research Unit, University of St. Andrews, UK, 63pp. plus appendices.

Hammond PS, Northridge SP, Thompson D, Gordon JCD, Hall AJ, Murphy SN & Embling CB (2008). Background information on marine mammals for Strategic Environmental Assessment 8. Report to the Department for Business, Enterprise and Regulatory Reform. Sea Mammal Research Unit, St. Andrews, Scotland, UK, 52pp.

Hammond PS, Northridge SP, Thompson D, Gordon JCD, Hall AJ, Sharples RJ, Grellier K & Matthiopoulos J (2004). Background information on marine mammals relevant to Strategic Environmental Assessment 5. Report to the DTI from Sea Mammal Research Unit, University of St. Andrews, UK, 73pp.

Hampton S, Kelly PR & Carter HR (2003). Tank vessel operations, seabirds and chronic oil pollution in California. *Marine Ornithology* **31**: 29-34.

Hanson N & Lonergan M (2012). Seaward extension of UK seal Management Units. Sea Mammal Research Unit, draft: 14/05/2012, 9pp.

Harris RE, Miller GW & Richardson WJ (2001). Seal responses to airgun sounds during summer seismic surveys in the Alaskan Beaufort Sea. *Marine Mammal Science* **17**: 795-812.

Hassel A, Knutsen T, Dalen J, Skaar, K, Løkkeborg S, Misund OA, Øivind Ø, Fonn M & Haugland EK (2004). Influence of seismic shooting on the lesser sandeel (*Ammodytes marinus*). *ICES Journal of Marine Science* **61**: 1165-1173.

Hastings MC, Popper AN, Finneran JJ & Lanford PJ (1996). Effect of low frequency underwater sound on hair cells of the inner ear and lateral line of the teleost fish *Astronotus ocellatus*. *Journal of the Acoustical Society of America* **99**: 1759-1766.

HM Government (2012a). Marine Strategy Framework Directive consultation - UK initial assessment and proposals for Good Environmental Status, 148pp.

HM Government (2012b). Marine Strategy Part One: UK Initial Assessment and Good Environmental Status. December 2012, 163pp.

Hoskin R & Tyldesley D (2006). How the scale of effects on internationally designated nature conservation sites in Britain has been considered in decision making: A review of authoritative decisions. English Nature Research Reports, No 704.

HSE (2003). Ship/platform collision incident database (2001). Prepared by Serco Assurance for the Health and Safety Executive 2003. Research report 53, 137pp.

Hyland J, Hardin D, Steinhauer M, Coats D, Green R & Neff J (1994). Environmental impact of offshore oil development on the outer continental shelf and slope off Point Arguello, California. *Marine Environmental Research* **37**: 195-229.

IMO (International Maritime Organisation) GloBallast website (accessed October 2012) http://globallast.imo.org/

Iona Energy Company (UK) Ltd (2012). Kells Field Development, Block 3/8d. Environmental Statement, February 2012, 198pp.

JNCC (1999). Seabird vulnerability in UK waters: block specific vulnerability. Joint Nature Conservation Committee, Aberdeen.

JNCC (2010a). Annex B - Statutory nature conservation agency protocol for minimising the risk of disturbance and injury to marine mammals from piling noise. June 2009. Joint Nature Conservation Committee, Aberdeen, UK, 12pp.

JNCC (2010b). JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys. August 2010. Joint Nature Conservation Committee, Aberdeen, UK, 16pp.

Kaiser MJ, Clarke KR, Hinz H, Austen MCV, Somerfield PJ & Karakassis I (2006). Global analysis of response and recovery of benthic biota to fishing. *Marine Ecology Progress Series* **311**: 1-14.

Kaiser MJ, Collie JS, Hall SJ, Jennings S & Poiner IR (2002a). Impacts of fishing gear on marine benthic habitats. In: M Sinclair & G Valdimarsson Eds. *Responsible fisheries in the marine ecosystem*. CABI Publishing, Wallingford, pp.197-217.

Kaiser MJ, Collie JS, Hall SJ, Jennings S & Poiner IR (2002b). Modification of marine habitats by trawling activities: prognosis and solutions. *Fish and Fisheries* **3**: 114-133.

Kingston PF, Dixon IMT, Hamilton S & Moore DC (1995). The impact of the Braer oil spill on the macrobenthic infauna of the sediments off the Shetland Islands. *Marine Pollution Bulletin* **30**: 445-459.

Knudsen FR, Enger PS & Sand O (1994). Avoidance responses to low frequency sound in

downstream migrating Atlantic salmon smolt, *Salmo salar*. *Journal of Fish Biology* **45**: 227-233.

Kober K, Webb A, Win I, Lewis L, O'Brien S, Wilson LJ & Reid J (2010). An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs. JNCC Report 431. JNCC Peterborough.

Kober K, Wilson LJ, Black J, O'Brien S, Allen S, Win I, Bingham C & Reid JB (2012). The identification of possible marine SPAs for seabirds in the UK: the application of Stage 1.1-1.4 of the SPA selection guidelines. JNCC Report No. 461, 88pp.

Lacroix DL, Lanctot RB, Reed JA, and McDonald TL (2003). Effect of underwater seismic surveys on molting male Long-tailed Ducks in the Beaufort Sea, Alaska. *Canadian Journal of Zoology* **81**: 1862–1875.

Law RJ, Kirby MF, Moore J, Barry J, Sapp M & Balaam J (2011). PREMIAM – Pollution Response in Emergencies Marine Impact Assessment and Monitoring: Post-incident monitoring guidelines. Science Series Technical Report, Cefas, Lowestoft,146: 164pp.

Lawson JW, Malme CI & Richardson WJ (2001). Assessment of noise issues relevant to marine mammals near the BP Clair Development. Report to BP from LGL Ltd., Environmental Research Associates and Engineering and Science Services.

Lewis S, Sherratt TN, Hamer KC & Wanless S (2001). Evidence of intra-specific competition for food in a pelagic seabird. *Nature* **412**: 816–819.

Lonergan M, Duck CD, Thompson D, Moss S & McConnell B (2011). British grey seal (*Halichoerus grypus*) abundance in 2008: an assessment based on aerial counts and satellite telemetry. *ICES Journal of Marine Science* **68**: 2201-2209.

Lucke K, Siebert U, Lepper PA & Blanchet M-A (2009). Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. *Journal of the Acoustical Society of America* **125**: 4060-4070.

Maitland G (2011). Offshore oil and gas in the UK - an independent review of the regulatory regime, December 2011, 205pp.

Malcom IA, Godfrey J & Youngson AF (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 renewables. Scottish Marine and Freshwater Science Vol 1 No 14, Marine Scotland Science, 72pp.

Marine Scotland (2010). The plan for offshore wind energy in Scottish Territorial Waters (STW). Strategic Environmental Assessment Environmental Report (ER): Volume 1. Halcrow Ltd. for Marine Scotland, 186pp.

Mason J (1983). Scallop and queen fisheries in the British Isles. Fishing News Books Ltd. Surrey, England.

Matthiopoulos J, McConnell B, Duck C & Fedack M (2004). Using satellite telemetry and aerial counts to estimate space use by grey seals around the British Isles. *Journal of Applied Ecology* **41**: 476-491.

McBreen F, Askew N, Cameron A, Connor D, Ellwood H & Carter A (2011). UKSeaMap 2010: Predictive mapping of seabed habitats in UK waters. JNCC Report, No. 446.

McCauley RD (1994). Seismic surveys. In, Swan, JM, Neff, JM and Young, PC (Eds) Environmental implications of offshore oil and gas developments in Australia. The findings of an independent scientific review. Australian Petroleum Exploration Association, Sydney, NSW. 696pp.

McCauley RD, Fewtrell J & Popper AN (2003). High intensity anthropogenic sound damages fish ears. *Journal of the Acoustical Society of America* **113**: 638-642.

MMS (2004). Geological and geophysical exploration for mineral resources on the Gulf of Mexico Outer Continental Shelf. Final programmatic environmental assessment. Report no. MMS 2004-054. Report to the U.S. Department of the Interior Minerals Management Service, New Orleans, 487pp.
http://www.ocsbbs.com/2004-054.pdf

Moray Offshore Renewables (2012). Environmental Statement. Telford, Stevenson, MacColl Wind Farms and Associated Transmission Infrastructure. EDP Renewables (EDPR UK) and Repsol Nuevas Energias UK.

Moriyasu M, Allain R, Benhalima K & Claytor R (2004). Effects of seismic and marine noise on invertebrates: A literature review. Canadian Science Advisory Secretariat. Research Document 2004/126.

National Commission (2011). National Commission on the BP Deepwater Horizon Spill and Offshore Drilling. Deep water: The Gulf oil disaster and the future of offshore drilling: Report to the president. US Government report. 398pp.

Natural Resource Damage Assessment (2012). Status update for the Deepwater Horizon oil spill, 91pp.

Nedwell JR & Needham K (2001). Measurement of drill rig noise. Subacoustech Ltd. Report No. 452R0102.

Nedwell JR, Edwards B & Needham K (2002). Noise measurements during pipeline laying operations around the Shetland Islands for the Magnus EOR project. Subacoustech Ltd. Report No. 473R0212.

Nedwell JR, Needham K & Edwards B (2001). Report on measurements of underwater noise from the Jack Bates Drill Rig. Subacoustech Ltd. Report No. 462R0202.

Neff JM, Bothner MH, Maciolek NJ & Grassle JF (1989). Impacts of exploratory drilling for oil and gas on the benthic environment of Georges Bank. *Marine Environmental Research* **27**: 77-114.

Nehls G, Betke K, Eckelmann S & Ros M (2007). Assessment and costs of potential engineering solutions for the mitigation of the impacts of underwater noise arising from the construction of offshore windfarms. Report to COWRIE Ltd. BioConsult SH report, Husum, Germany, 47pp.

Nowacek DP, Thorne LH, Johnston DW & Tyack PL (2007). Responses of cetaceans to anthropogenic noise. *Mammal Review* **37**: 81-115.

ODPM (2005). Government circular: Biodiversity and geological conservation - statutory obligations and their impact within the planning system. ODPM Circular 06/2005. Office of the Deputy Prime Minister, UK, 88pp.

OGP (2010). Environmental performance in the E&P industry: 2010 data. Report No. 466, October 2011. 50pp

Oil and Gas UK (2009). Accident statistics for offshore units on the UKCS 1990-2007 Issue 1 April 2009, 127pp.

OSPAR (2000). Quality Status Report 2000. OSPAR Commission, London.
http://www.ospar.org/eng/html/qsr2000/QSR2000welcome3.htm

OSPAR (2009). Assessment of impacts of offshore oil and gas activities in the North-East Atlantic. OSPAR Commission, 40pp.

OSPAR (2009). Assessment of impacts of offshore oil and gas activities in the North-East Atlantic. OSPAR Commission, 40pp.

OSPAR (2010). Quality Status Report 2010. OSPAR Commission, London, 176pp.

OSPAR (2012). Report of the OSPAR Workshop on research into possible effects of regular platform lighting on specific bird populations. Offshore Industry Series, 17pp.

Parry GD & Gason A (2006). The effect of seismic surveys on catch rates of rock lobsters in western Victoria, Australia. *Fisheries Research* **79**: 272-284.

Peacock EE, Nelson RK, Solow AR, Warren JD, Baker JL, & Reddy CM (2005). The West Falmouth oil spill: 100 kg of oil persists in marsh sediments. *Environmental Forensics* **6**:273-281.

Popper AN, Carlson TJ, Hawkins AD, Southall BJ & Gentry RL (2006). Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper. Report to the Fisheries Hydroacoustic Working Group, California Department of Transportation, USA, 15pp.

Popper AN, Fewtrell J, Smith ME & McCauley RD (2003). Anthropogenic sound: Effects on the behavior and physiology of fishes. *Marine Technology Society Journal* **37**: 35-40.

Popper AN, Smith ME, Cott PA, Hanna BW, MacGillivray AO, Austin ME & Mann DA (2005). Effects of exposure to seismic airgun use on hearing of three fish species. *Journal of the Acoustical Society of America* **117**: 3958-3971.

Reddy CM, Eglinton TI, Hounshell A, White HK, Xu L, Gaines RB & Frysinger GS (2002). The West Falmouth oil spill after thirty years: the persistence of petroleum hydrocarbons in marsh sediments. *Environmental Science and Technology* **36**: 4754 -4760.

Richardson WJ, Greene CR Jr, Malme CI & Thomson DH (1995). *Marine Mammals and Noise.* Academic Press, San Diego, US, 576pp.

Robinson JE, Newell RC, Seiderer LJ & Simpson NM (2005). Impacts of aggregate dredging on sediment composition and associated benthic fauna at an offshore dredge site in the southern North Sea. *Marine Environmental Research* **60**: 51-68.

Russell DJF, McConnell B, Thompson D, Duck C, Morris C, Harwood J & Matthiopoulos J (2013). Uncovering the links between foraging and breeding regions in a highly mobile mammal. *Journal of Applied Ecology* doi: 10.1111/1365-2664.12048

SCANS-II (2008). Small Cetaceans in the European Atlantic and North Sea. Final Report to the European Commission under project LIFE04NAT/GB/000245. Available from Sea Mammal Research Unit, University of St. Andrews, 54pp. plus appendices.

SCOS (2009). Scientific advice on matters related to the management of seal populations: 2009.

SCOS (2012). Scientific advice on matters related to the management of seal populations: 2012. Special Committee on Seals, 174pp.

Scottish Government (2000). Habitats and Birds Directive. Rural Affairs Department. Update of Scottish Office Circular 6/1995.

Scottish Government (2010). Scottish Planning Policy. February 2010, 55pp.

Scottish Government (2011). Scotland's Marine Atlas: Information for The National Marine Plan. The Scottish Government, Edinburgh, 191pp.

Scottish Natural Heritage (SNH) (2006a). Sullom Voe Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scottish Natural Heritage, 14pp.

Scottish Natural Heritage (SNH) (2006b). Yell Sound Coast Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scottish Natural Heritage, 11pp.

Scottish Natural Heritage (SNH) (2006c). North Rona Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scottish Natural Heritage, 11pp.

Scottish Natural Heritage (SNH) (2006d). Sanday Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scottish Natural Heritage, 13pp.

Scottish Natural Heritage (SNH) (2006e). Mousa Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scottish Natural Heritage, 12pp.

Scottish Natural Heritage (SNH) (2006f). Faray and Holm of Faray Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scottish Natural Heritage, 7pp.

SEERAD (2000). Nature conservation: implementation in Scotland of EC directives on the conservation of natural habitats and of wild flora and fauna and the conservation of wild birds ("the Habitats and Birds Directives"). June 2000. Revised guidance updating Scottish Office circular no. 6/199.

Sharples RJ, Cunningham L & Hammond PS (2005). Distribution and movement of harbour seals around the UK. Briefing paper by the Sea Mammal Research Unit (SMRU), Gatty Marine Laboratory, University of St Andrews, for the Special Committee on Seals (SCOS) report: Scientific advice on matters related to the management of seal populations, pp.66-69. http://www.scotland.gov.uk/Resource/Doc/921/0020956.pdf

Sharples RJ, Matthiopoulos J & Hammond PS (2008). Distribution and movements of harbour seals around the coast of Britain. Report to the Department of Energy and Climate Change (DECC). Sea Mammal Research Unit, St. Andrews, UK, 65pp.

Sharples RJ, Moss SE, Patterson TA & Hammond PS (2012). Spatial Variation in Foraging Behaviour of a Marine Top Predator (*Phoca vitulina*) Determined by a Large-Scale Satellite Tagging Program. *PLoS ONE* **7**: 1-14. doi:10.1371/journal.pone.0037216

Simmonds M, Dolman S & Weilgart L (2003). Oceans of Noise. A Whale and Dolphin Conservation Society Science Report.

Skalski JR, Pearson WH & Malme CI (1992). Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes* spp.). *Canadian Journal of Fisheries and Aquatic Science* **49**: 1343-1356.

Slotte A, Hansen K, Dalen J & Ona E (2004). Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast. *Fisheries Research* **67**: 143-150.

SMRU (2007). Potential impact of oil and gas exploration and development on SACs for bottlenose dolphins and other marine mammals in the Moray Firth and Cardigan Bay/Pembrokeshire. Report to the DTI. Sea Mammal Research Unit, University of St Andrews, Scotland, 13pp.

SMRU (2011). Utilisation of space by grey and harbour seals in the Pentland Firth and Orkney waters. Scottish Natural Heritage Commissioned Report No. 441. 50pp + Appendices.

SNCB (2012). Guidance for staff advising on the potential risk of seal corkscrew injuries April 2012.

Snelgrove PVR (1999). Getting to the bottom of marine biodiversity: Sedimentary habitats. *BioScience* **49**: 129-138.

SOTEAG (1993). Dealing with the wildlife casualties of the Braer oil spill, Shetland, January 1993. Report by the Shetland Oil Terminal Environmental Advisory Group.

Southall BL, Bowles AE, Ellison WT, Finneran JJ, Gentry RL, Greene Jr. CR, Kastak D, Ketten DR, Miller JH, Nachtigall PE, Richardson WJ, Thomas JA & Tyack PL (2007). Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33: 411-522.

Stemp R (1985). Observations on the effects of seismic exploration on seabirds. In: Greene GD, Engelhardt FR & Paterson RJ (Eds) *Proceedings of the Workshop on Effects of Explosives Use in the Marine Environment*. Jan 29-31, 1985, Halifax, Canada.

Stone CJ & Tasker ML (2006). The effects of seismic airguns on cetaceans in UK waters. *Journal of Cetacean Research and Management* **8**: 255-263.

Stone CJ (2003). The effects of seismic activity on marine mammals in UK waters, 1998-2000. JNCC Report no. 323. Joint Nature Conservation Committee, Peterborough.

Swift RJ & Thompson PM (2000). Identifying potential sources of industrial noise in the Foinaven and Schiehallion region. Report prepared for BP Amoco Exploration, UK Operations, Farburn Industrial Estate, Dyce, Aberdeen, Scotland.

Tasker ML, Amundin M, Andre M, Hawkins A, Lang W, Merck T, Scholik-Schlomer A, Teilmann J, Thomsen F, Werner S & Zakharia M (2010). Underwater noise and other forms of energy: Marine Strategy Framework Directive Task Group 11 report, 64pp.

Teal JM & Howarth RW (1984). Oil spill studies: a review of ecological effects. *Environmental Management* **8**: 27-43

Teal JM, Farrington JW, Burns KA, Stegeman JJ, Tripp BW, Woodin B & Phinney C (1992). The West Falmouth oil spill after 20 years: fate of fuel oil compounds and effects on animals. *Marine Pollution Bulletin* **24**: 607-614.

Thaxter CB, Lascelles B, Sugar K, ASCP Cook, Roos S, Bolton M, Langston RHW & Burton NHK (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation* 156: 53–61.

Thompson D, Bexton S, Brownlow A, Wood D, Patterson T, Pye K, Lonergan M & Milne R (2010). Report on recent seal mortalities in UK waters caused by extensive lacerations. Sea Mammal Research Unit, 20pp.

Thompson D, Sjoberg M, Bryant ME, Lovell P & Bjorge A (1998). Behavioural and physiological responses of harbour (*Phoca vitulina*) and grey (*Halichoerus grypus*) seals to seismic surveys. Report the European Commission of BROMMAD Project.

Trannum HC, Nilsson HC, Schaanning MT & Øxnevad S (2010). Effects of sedimentation from water-based drill cuttings and natural sediment on benthic macrofaunal community structure and ecosystem processes. *Journal of Experimental Marine Biology and Ecology* **383**: 111–121

Trannum HC, Setvik Å, Norling K & Nilsson HC (2011). Rapid macrofaunal colonization of water-based drill cuttings on different sediments. *Marine Pollution Bulletin* **62**: 2145–2156

Turrell WR, Henderson EW, Slesser G, Payne R & Adams RD (1992). Seasonal changes in the circulation of the northern North Sea. *Continental Shelf Research* **12**: 257-286.

Tyldesley & Associates (2012). Habitats Regulations Appraisal of Plans: Guidance for Plan-making Bodies in Scotland. Scottish Natural Heritage report no. 1739 Version 2.0, 67pp.

UKOOA (2003). Guidelines for ship/installation collision avoidance. Issue 1, February 2010. 88pp.

Van der Graaf AJ, Ainslie MA, André M, Brensing K, Dalen J, Dekeling RPA, Robinson S, Tasker ML, Thomsen F, Werner S (2012). European Marine Strategy Framework Directive - Good Environmental Status (MSFD GES): Report of the Technical Subgroup on Underwater noise and other forms of energy, 75pp.

Wakefield ED, Bodey TW, Bearhop S, Blackburn J, Colhoun K, Davies R, Dwyer RG, Green J, Grémillet D, Jackson AL, Jessopp MJ, Kane A, Langston RHW, Lescroël A, Murray S, Le Nuz M, Patrick SC, Péron C, Soanes L, Wanless S, Votier SC & Hamer KC (2013). Space partitioning without territoriality in gannets. *Science*. Published online 6 June 2013 [DOI:10.1126/science.1236077]

Weilgart LS (2007). The impacts of anthropogenic ocean noise on cetaceans and implications for management. *Canadian Journal of Zoology* **85**: 1091-1116.

Wiese FK, Montevecchi WA, Davoren GK, Huettmann F, Diamond AW & Linke J (2001). Seabirds at risk around offshore oil platforms in the North-west Atlantic. *Marine Pollution Bulletin* **42**: 1285-1290.

Williams JM, Tasker ML, Carter IC & Webb A (1994). Method for assessing seabird vulnerability to surface pollutants. *Ibis* **137**: 147-152.

Witbaard R & Klein R (1993). A method to estimate the bottom trawl intensity independently from fisheries itself by using internal molluscan growth lines. *ICES CM 1993* **K:16**, 8pp.

Appendix A – The Sites

A1 Coastal and Marine Special Protection Areas

The migratory and/or Annex I bird species for which SPAs are selected in the UK are listed in Box A.1, and the SPAs and their qualifying features are given in Table A.1 and their locations shown in the Map A.1. JNCC[43] note that, "*The legal list of qualifying species, for which a Special Protection Area (SPA) has been selected and is managed, is given on the relevant SPA citation (available from the country agency concerned). A review of UK network of SPAs was co-ordinated by JNCC in the late 1990s. Following formal submission to, and agreement by, relevant Ministers, the results were published in 2001. This Review revised the list of qualifying species at some SPAs.*

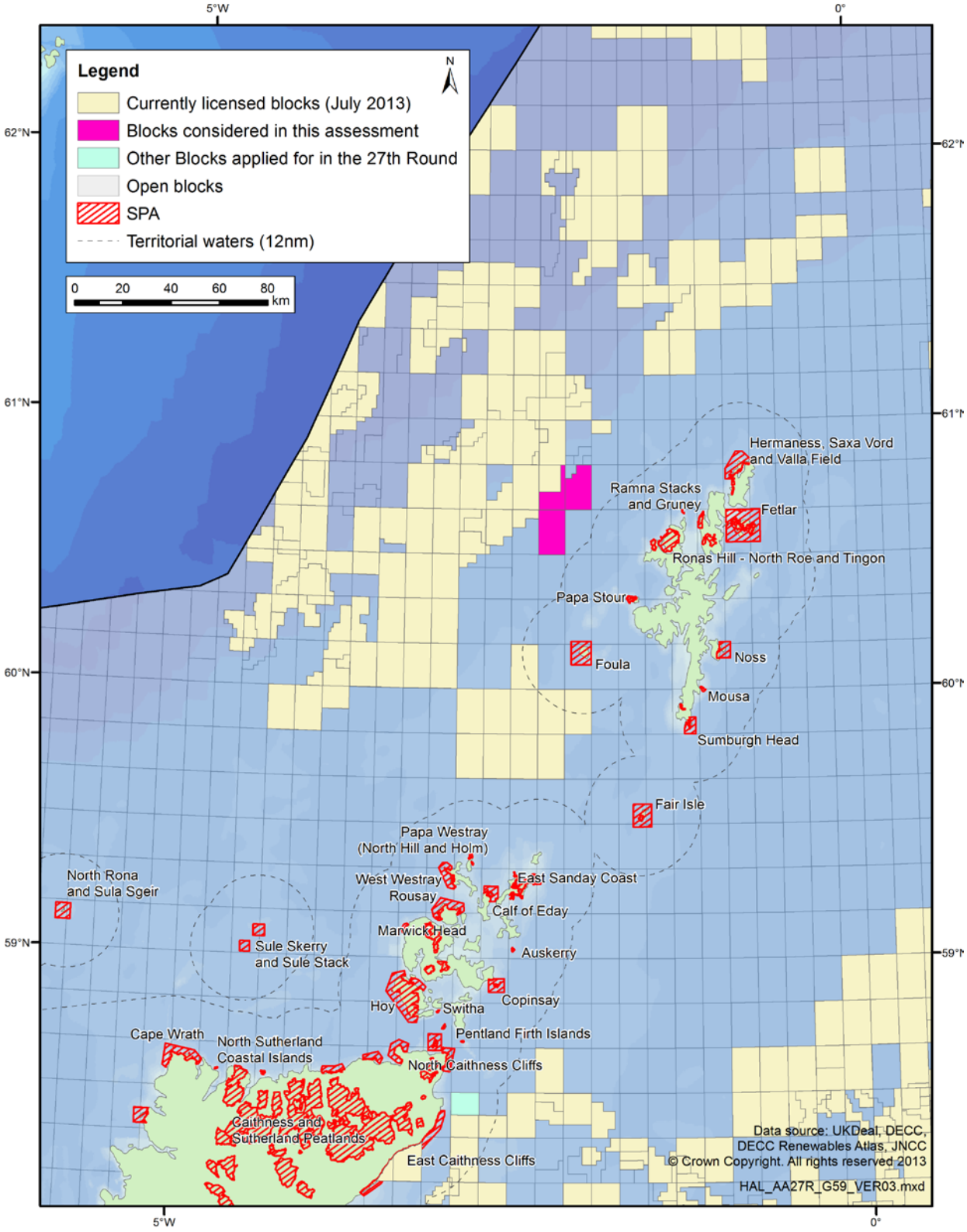
However, it is taking some time to revise all the relevant SPA citations in the light of these agreed changes to the affected lists of qualifying species. Where there is a mismatch between species listed in extant citations and listed in the 2001 Review for the same sites, there has been confusion as to the 'correct' list of qualifying species to be used at any site for purposes of management, assessment and development control.

The individual site accounts in 2001 Review should be taken as the definitive list of qualifying species at the SPAs concerned. However, at sites where there remain differences between that list of qualifying species and the extant site citation, then the relevant country agency should be contacted for further guidance."

A review of SPA sites was undertaken to identify where a mismatch between the qualifying species lists existed. Each country agency (NE, SNH, CCW, NIEA) was contacted to clarify those features which should be considered. The species listed in Table A.1 reflect the outcome of this review.

[43] http://jncc.defra.gov.uk/page-5485 (accessed: October 2012)

Map A.1: Location of SPAs



Box A.1: Migratory and/or Annex I bird species for which SPAs are selected in the UK

Divers and grebes
Red-throated diver *Gavia stellata*
Black-throated diver *Gavia arctica*
Little grebe *Tachybaptus ruficollis*
Great crested grebe *Podiceps cristatus*
Slavonian grebe *Podiceps auritus*

Seabirds
Fulmar *Fulmarus glacialis*
Manx shearwater *Puffinus puffinus*
Storm petrel *Hydrobates pelagicus*
Leach's petrel *Oceanodroma leucorhoa*
Gannet *Morus bassanus*
Cormorant *Phalacrocorax carbo carbo*
Shag *Phalacrocorax aristotelis*
Guillemot *Uria aalge*
Razorbill *Alca torda*
Puffin *Fratercula arctica*

Gulls, terns and skuas
Arctic skua *Stercorarius parasiticus*
Great skua *Catharacta skua*
Mediterranean gull *Larus melanocephalus*
Black-headed gull *Larus ridibundus*
Common gull *Larus canus*
Lesser black-backed gull *Larus fuscus*
Herring gull *Larus argentatus*
Great black-backed gull *Larus marinus*
Kittiwake *Rissa tridactyla*
Sandwich tern *Sterna sandvicensis*
Roseate tern *Sterna dougallii*
Common tern *Sterna hirundo*
Arctic tern *Sterna paradisaea*
Little tern *Sterna albifrons*

Crakes and rails
Spotted crake *Porzana porzana*
Corncrake *Crex crex*
Coot *Fulica atra*

Birds of prey and owls
Honey buzzard *Pernis apivorus*
Red kite *Milvus milvus*
Marsh harrier *Circus aeruginosus*
Hen harrier *Circus cyaneus*
Golden eagle *Aquila chrysaetos*
Osprey *Pandion haliaetus*
Merlin *Falco columbarius*
Peregrine *Falco peregrinus*
Short-eared owl *Asio flammeus*

Other bird species
Capercaillie *Tetrao urogallus*
Nightjar *Caprimulgus europaeus*
Woodlark *Lullula arborea*
Fair Isle wren *Troglodytes troglodytes fridariensis*
Aquatic warbler *Acrocephalus paludicola*
Dartford warbler *Sylvia undata*
Chough *Pyrrhocorax pyrrhocorax*
Scottish crossbill *Loxia scotica*

Waders
Oystercatcher *Haematopus ostralegus*
Avocet *Recurvirostra avosetta*
Stone curlew *Burhinus oedicnemus*
Ringed plover *Charadrius hiaticula*
Dotterel *Charadrius morinellus*
Golden plover *Pluvialis apricaria*
Grey plover *Pluvialis squatarola*
Lapwing *Vanellus vanellus*
Knot *Calidris canutus*
Sanderling *Calidris alba*
Purple sandpiper *Calidris maritima*
Dunlin *Calidris alpina alpina*
Ruff *Philomachus pugnax*
Snipe *Gallinago gallinago*
Black-tailed godwit *Limosa limosa* (breeding)
Black-tailed godwit *Limosa limosa islandica* (non-breeding)
Bar-tailed godwit *Limosa lapponica*
Whimbrel *Numenius phaeopus*
Curlew *Numenius arquata*
Redshank *Tringa totanus*
Greenshank *Tringa nebularia*
Wood sandpiper *Tringa glareola*
Turnstone *Arenaria interpres*
Red-necked phalarope *Phalaropus lobatus*

Waterfowl
Bewick's swan *Cygnus columbianus bewickii*
Whooper swan *Cygnus cygnus*
Bean goose *Anser fabalis*
Pink-footed goose *Anser brachyrhynchus*
Russian white-fronted goose *Anser albifrons albifrons*
Greenland white-fronted goose *Anser albifrons flavirostris*
Icelandic greylag goose *Anser anser*
Greenland barnacle goose *Branta leucopsis*
Svalbard barnacle goose *Branta leucopsis*
Dark-bellied brent goose *Branta bernicla bernicla*
Canadian light-bellied brent goose *Branta bernicla hrota*
Svalbard light-bellied brent goose *Branta bernicla hrota*
Shelduck *Tadorna tadorna*
Wigeon *Anas penelope*
Gadwall *Anas strepera*
Teal *Anas crecca*
Mallard *Anas platyrhynchos*
Pintail *Anas acuta*
Shoveler *Anas clypeata*
Pochard *Aythya ferina*
Tufted duck *Aythya fuligula*
Scaup *Aythya marila*
Eider *Somateria mollissima*
Long-tailed duck *Clangula hyemalis*
Common scoter *Melanitta nigra*
Velvet scoter *Melanitta fusca*
Goldeneye *Bucephala clangula*
Red-breasted merganser *Mergus serrator*
Goosander *Mergus merganser*

Table A.1: Coastal and marine SPAs and their Qualifying Features

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages[44]
SHETLAND				
Sumburgh Head SPA	2477.91	Breeding: Arctic tern	N/A	Breeding: Seabirds
Lochs of Spiggie and Brow SPA	141.48	Over winter: Whooper swan	N/A	N/A
Foula SPA	7,985.49	Breeding: Arctic tern Leach's storm petrel Red-throated diver	Breeding: Great skua Guillemot Puffin Shag	Breeding: Seabirds
Papa Stour SPA	569.03	Breeding: Arctic tern	Breeding: Ringed plover	N/A
Ronas Hill-North Roe and Tingon SPA	5,470.2	Breeding: Merlin Red-throated diver	*Breeding:* Great skua	N/A
Ramna Stacks and Gruney SPA	11.59	Breeding: Leach's storm petrel	N/A	N/A
Otterswick and Graveland SPA	2,241.41	Breeding: Red-throated diver	N/A	N/A
Hermaness, Saxa Vord and Valla Field SPA	6,833.04	Breeding: Red-throated diver	Breeding: Gannet Great skua Puffin	Breeding: Seabirds
Fetlar SPA	16962.16	Breeding: Arctic tern Red-necked phalarope	Breeding: Dunlin Great skua Whimbrel	Breeding: Seabirds
Noss SPA	3338.34	N/A	Breeding: Gannet Great skua Guillemot	Breeding: Seabirds
Mousa SPA	197.98	Breeding: Arctic tern Storm petrel	N/A	N/A
Fair Isle SPA	6824.4	Breeding: Arctic tern Fair Isle wren	Breeding: Guillemot	Breeding: Seabirds
ORKNEY				
Pentland Firth Islands SPA	170.51	Breeding: Arctic tern	N/A	N/A
Switha SPA	57.39	Over winter: Barnacle goose	N/A	N/A
Orkney Mainland Moors SPA	4444.35	Breeding: Hen harrier Red-throated diver Short-eared owl	N/A	N/A

[44] A seabird assemblage of international importance: the area regularly supports at least 20,000 seabirds. Or, a wetland of international importance: the area regularly supports at least 20,000 waterfowl.

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages[44]
		Over winter: Hen harrier		
Hoy SPA	18122.17	Breeding: Peregrine Red-throated diver	Breeding: Great skua	Breeding: Seabirds
Marwick Head SPA	475.58	N/A	Breeding: Guillemot	Breeding: Seabirds
Rousay SPA	5483.37	Breeding: Arctic tern	N/A	Breeding: Seabirds
West Westray SPA	3781.29	Breeding: Arctic tern	Breeding: Guillemot	Breeding: Seabirds
Papa Westray (North Hill and Holm) SPA	245.71	Breeding: Arctic tern	Breeding: Arctic skua	N/A
Calf of Eday SPA	2668.91	N/A	N/A	Breeding: Seabirds
East Sanday Coast SPA	1515.23	Over winter: Bar-tailed godwit	Over winter: Purple sandpiper Turnstone	N/A
Auskerry SPA	101.97	Breeding: Arctic tern Storm petrel	N/A	N/A
Copinsay SPA	3607.7	N/A	N/A	Breeding: Seabirds
Sule Skerry and Sule Stack SPA	3909.45	Breeding: Leach's storm petrel Storm petrel	Breeding: Gannet Puffin	Breeding: Seabird
NORTH COAST OF SCOTLAND				
North Rona and Sula Sgeir SPA	6850.58	Breeding: Leach's petrel Storm petrel	Breeding: Razorbill Puffin Fulmar Great black-backed gull Gannet Kittiwake Guillemot	Breeding: Seabirds
Cape Wrath SPA	6737.26	N/A	N/A	Breeding: Seabirds
North Sutherland Coastal Islands SPA	221.11	Over winter: Barnacle goose	N/A	N/A
North Caithness Cliffs SPA	14621.14	Breeding: Peregrine	Breeding: Guillemot	Breeding: Seabirds
Caithness Lochs SPA	1378.45	Over winter: Greenland white-fronted goose Whooper swan	Over winter: Greylag goose	N/A
Caithness and Sutherland Peatlands SPA	145516.75	Breeding: Black-throated diver Golden eagle Golden plover Hen harrier Merlin Red-throated diver Short-eared owl	Breeding: Common scoter Dunlin Greenshank Wigeon	N/A

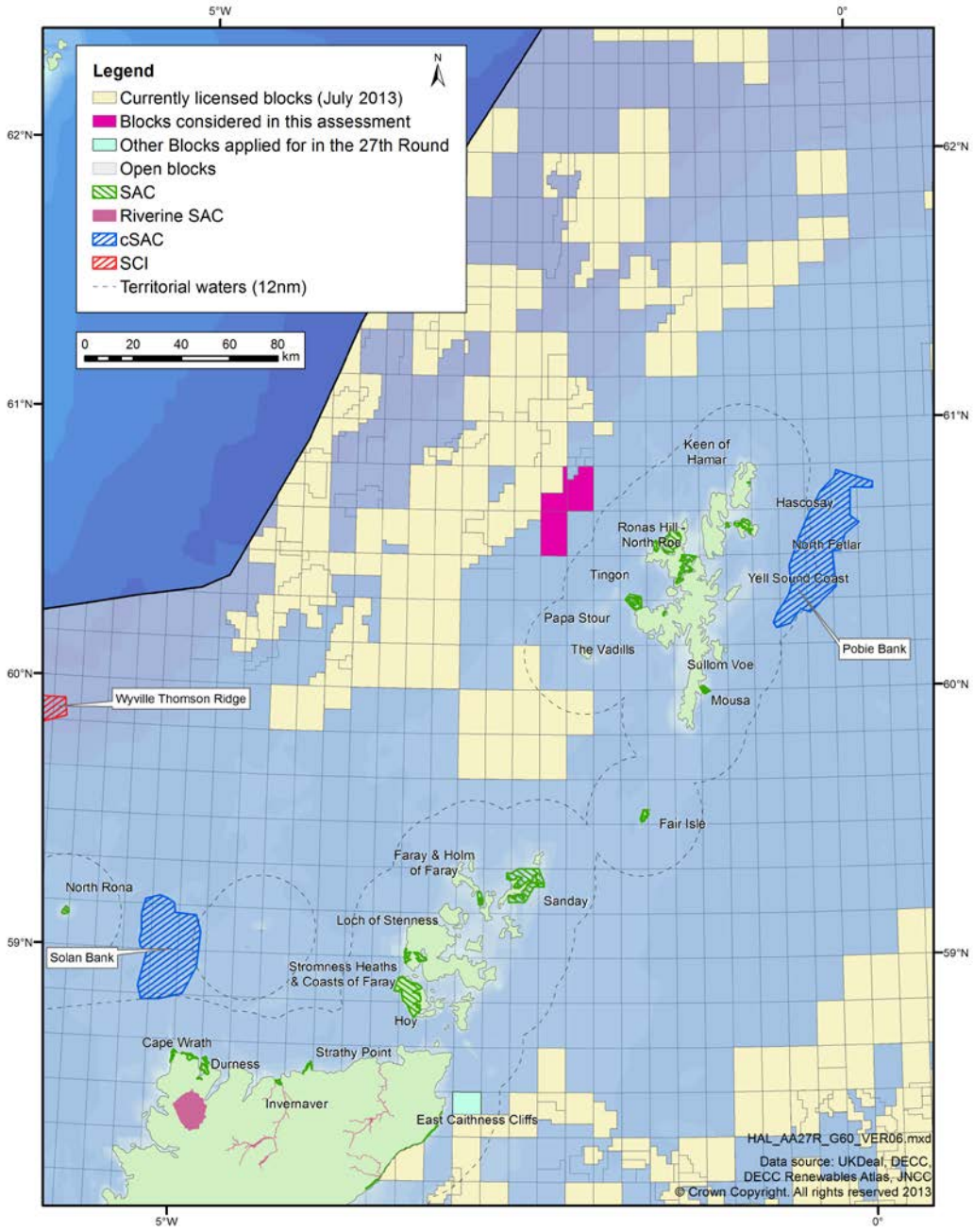
Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages[44]
		Wood sandpiper		
MORAY FIRTH AND ABERDEENSHIRE				
East Caithness Cliffs SPA	11690.92	Breeding: Peregrine	Breeding: Guillemot Kittiwake Razorbill Herring gull	Breeding: Seabirds

A2 Coastal and Marine Special Areas of Conservation

This section includes coastal or nearshore marine (within 12nm boundary) Special Areas of Conservation (SAC) sites which contain one or more of the Annex I coastal habitats listed in Box A.2 (below) or examples of Annex II qualifying marine species. Abbreviations for the Annex 1 habitats used in SAC site summaries (Tables A.2, A.3 and A4, and Map A.2) are listed in Box A.2.

Relevant offshore (outside or crossing the 12nm boundary) SACs are included on Map A.2 and described in Section A3. Riverine/freshwater SACs which are designated for migratory fish and/or freshwater pearl mussel are included on Map A.2 and considered in Section A4.

Map A.2: Location of coastal, marine and riverine SACs



Box A.2: Annex 1 Habitat Abbreviations Used in Site Summaries

Annex I Habitat (abbreviated)	Annex I Habitat(s) (full description)
Bogs	Active raised bogs * Priority feature Blanket bogs * Priority feature Degraded raised bogs still capable of natural regeneration Depressions on peat substrates of the *Rhynchosporion* Transition mires and quaking bogs
Coastal dunes	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) Coastal dunes with *Juniperus* spp. Decalcified fixed dunes with *Empetrum nigrum* Dunes with *Hippophae rhamnoides* Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) Embryonic shifting dunes Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature Humid dune slacks Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)
Coastal lagoons	Coastal lagoons *Priority feature
Estuaries	Estuaries
Fens	Alkaline fens Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* * Priority feature Petrifying springs with tufa formation (*Cratoneurion*) * Priority feature
Forest	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature Old sessile oak woods with *Quercus robur* on sandy plains
Grasslands	Alpine and subalpine calcareous grasslands Calaminarian grasslands of the *Violetalia calaminariae* Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) (important orchid sites) * Priority feature Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe) * Priority feature
Heaths	Alpine and Boreal heaths European dry heaths Northern Atlantic wet heaths with *Erica tetralix*
Inlets and bays	Large shallow inlets and bays
Limestone pavements	Limestone pavements * Priority feature
Machairs	Machairs

Annex I Habitat (abbreviated)	Annex I Habitat(s) (full description)
Mudflats and sandflats	Mudflats and sandflats not covered by seawater at low tide
Reefs	Reefs
Rocky slopes	Calcareous rocky slopes with chasmophytic vegetation
Running freshwater	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
Salt marshes and salt meadows	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) *Salicornia* and other annuals colonising mud and sand Spartina swards (*Spartinion maritimae*)
Sandbanks	Sandbanks which are slightly covered by sea water all the time
Scree	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
Scrub (mattoral)	*Juniperus communis* formations on heaths or calcareous grasslands
Sea caves	Submerged or partially submerged sea caves
Sea cliffs	Vegetated sea cliffs of the Atlantic and Baltic coasts
Standing freshwater	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. Natural dystrophic lakes and ponds Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
Vegetation of drift lines	Annual vegetation of drift lines
Vegetation of stony banks	Perennial vegetation of stony banks

Table A.2: Coastal and marine SACs and their Qualifying Features

Site Name	Area (ha)	Annex I Habitat Primary	Annex II Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
SHETLAND					
The Vadills SAC	62.43	Coastal lagoons	N/A	N/A	N/A
Papa Stour SAC	2076.69	Reefs Sea caves	N/A	N/A	N/A
Tingon SAC	569.3	Bogs	Standing freshwater	N/A	N/A
Ronas Hill-North Roe SAC	4900.9	Standing freshwater Heath Bogs	Heath Scree	N/A	N/A
Sullom Voe SAC	2698.55	Inlets and bays	Coastal lagoons Reefs	N/A	N/A
Hascosay SAC	164.92	Bogs	N/A	N/A	Otter *Lutra lutra*
Yell Sound Coast SAC	1540.55	N/A	N/A	Otter *Lutra lutra* Harbour seal *Phoca vitulina*	N/A
Keen of Hamar SAC	38.52	Grasslands Scree	Heath	N/A	N/A
North Fetlar SAC	1581.93	Heath Fens	N/A	N/A	N/A
Mousa SAC	530.6	N/A	Reefs Sea caves	Harbour seal *Phoca vitulina*	N/A
Fair Isle SAC	561.27	Sea cliffs	Heaths	N/A	N/A
ORKNEY					
Hoy SAC	9499.7	Sea cliffs Standing freshwater Heath Bog	Heath Fens Rocky slopes	N/A	N/A
Loch of Stenness SAC	791.87	Coastal lagoons	N/A	N/A	N/A
Stromness Heaths and Coasts SAC	635.78	Sea cliffs Heath	Fens	N/A	N/A
Faray and Holm of Faray SAC	785.68	N/A	N/A	Grey seal *Halichoerus grypus*	N/A
Sanday SAC	10971.65	Reefs	Sandbanks Mudflats and sandflats	Harbour seal *Phoca vitulina*	N/A

Site Name	Area (ha)	Annex I Habitat Primary	Annex II Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
NORTH COAST OF SCOTLAND					
North Rona SAC	628.53	Sea cliffs Sea caves Reefs	N/A	Grey seal *Halichoerus grypus*	N/A
Cape Wrath SAC	1018.18	Sea cliffs	N/A	N/A	N/A
Durness SAC	1212.74	Coastal dunes Standing freshwater Grasslands Limestone pavements	Coastal dunes Heath Grasslands Fens	N/A	Otter *Lutra lutra*
Invernaver SAC	294.54	Coastal dunes Heath Grasslands	Coastal dunes Fens	N/A	N/A
Strathy Point SAC	203.58	Sea cliffs	N/A	N/A	N/A
MORAY FIRTH AND ABERDEENSHIRE					
East Caithness Cliffs SAC	442.64	Sea cliffs	N/A	N/A	N/A

A3 Offshore Special Areas of Conservation

Table A.3: Offshore SACs and their Qualifying Features from West of Shetland

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Pobie Bank Reef cSAC	101,125	Reefs	N/A	N/A	N/A
Solan Bank Reef cSAC	85,593	Reefs	N/A	N/A	N/A
Wyville Thomson Ridge SCI	173,995	Reefs	N/A	N/A	N/A

A4 Riverine Special Areas of Conservation

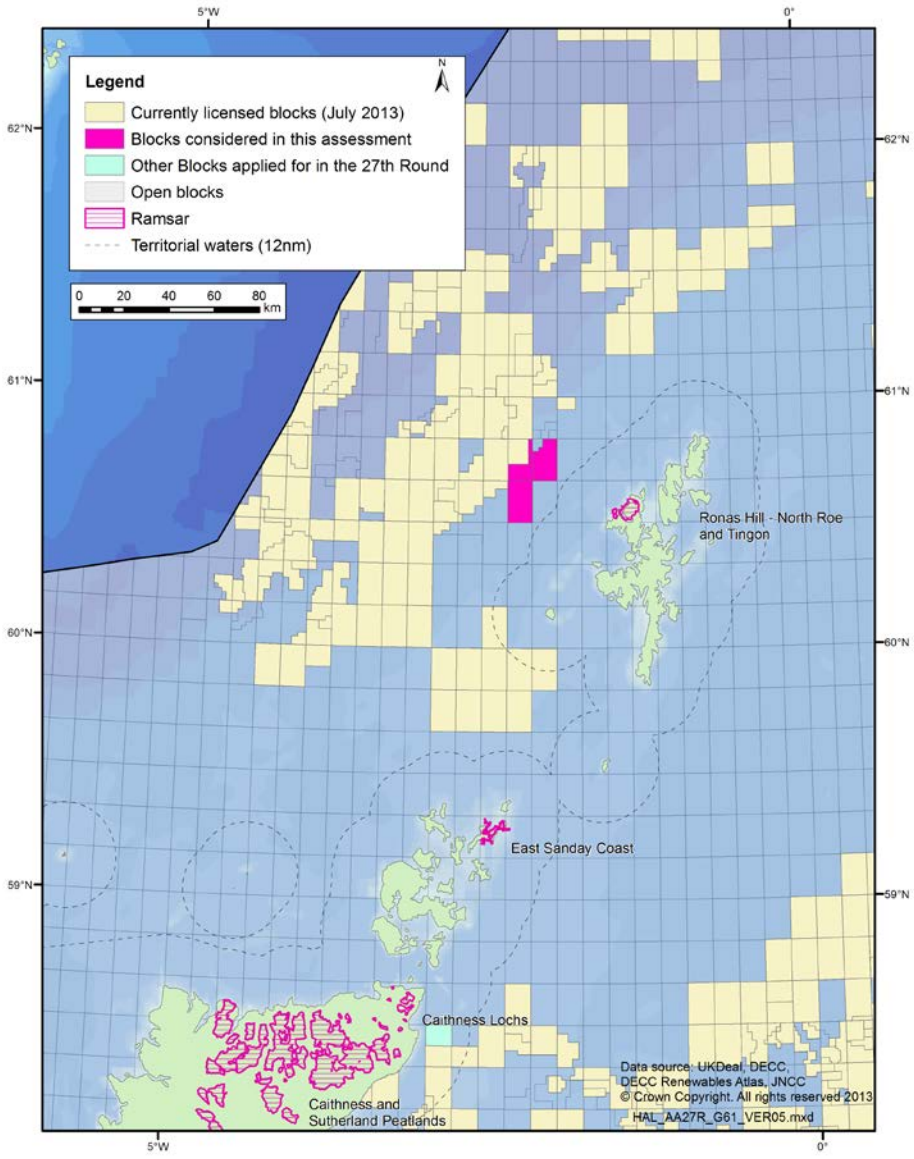
Table A.4: Riverine SACs designated for migratory fish and/or the freshwater pearl mussel

Site Name	Freshwater pearl mussel *Margaritifera margaritifera*	Migratory fish[1]
Foinaven	✓	-
River Borgie	✓	AS
River Naver	✓	AS
River Thurso	-	AS
Berriedale and Langwell Waters	-	AS

[1] *AS - Atlantic salmon Salmo salar*

A5 Ramsar sites

Map A.3: Location of coastal Ramsar sites



The coastal Ramsar sites are also SPA.s and/or SACs (although site boundaries are not always strictly coincident and a Ramsar site may comprise one or more Natura 2000 sites), see tabulation below.

Table A.5: Wetlands of international importance

Ramsar name	SPA name	SAC name
Caithness and Sutherland Peatlands	Caithness and Sutherland Peatlands	Caithness and Sutherland Peatlands
Caithness Lochs	Caithness Lochs	-
East Sanday Coast	East Sanday Coast	Sanday
Ronas Hill – North Roe and Tingon	Ronas Hill – North Roe and Tingon	Ronas Hill – North Roe

Appendix B – Re-screening tables for the identification of likely significant effects on the sites

In the original block screening assessment, the implications of geophysical survey, drilling and physical effects were considered in a generic way for all Blocks applied for in the 27th Round (DECC 2012) for sites where there was a foreseeable possibility of interactions[45]. Subsequent to the publication of the screening assessment (DECC 2012), proposed work programmes for the Blocks have been confirmed by the applicant companies (see below), or in some cases applications made for Blocks have been withdrawn.

The proposed work programme for the Blocks from the range of licence applications received is as follows, (see also Section 2.2 for details):

- 206/9b, 206/10b, 206/14 – 1 contingent well and shoot 3D seismic

In light of the proposed work programme, and confirmation of those Blocks proposed to be taken forward for licensing, those sites initially identified in the screening document as having a foreseeable interaction with offshore oil and gas activities are re-screened below. The potential for likely significant effects on relevant Natura 2000 sites (listed in Appendix A) is considered in the table below and where relevant, the location of further appropriate assessment is clearly signposted. More information on the conservation objectives and status of those sites identified as requiring consideration in the AA is provided in Appendix C.

Activities which may be carried out following the grant of a licence, and which by themselves or in combination with other activities can affect the conservation objectives of relevant sites are considered under the following broad headings:

[45] Coastal and marine sites along the coasts of the United Kingdom and in territorial waters, Offshore sites (i.e. those largely or entirely beyond 12nm from the coast), Riverine sites designated for migratory fish and/or the freshwater pearl mussel, sites designated for breeding red-throated divers, sites in the waters of other member states at or adjacent to the UK median line.

- Physical disturbance and other effects (e.g. rig siting, marine discharges)
- Underwater noise (in particular, deep geological seismic and other site surveys, and VSP)
- Oil spills (including all liquid phase hydrocarbons)
- In-combination effects (e.g. cumulative and synergistic and secondary/indirect effects)

B1 Coastal and marine Special Protection Areas

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
SHETLAND								
Sumburgh Head	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding tern. Seabird assemblage. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds and tern), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Lochs of Spiggie and Brow	-	✓	-	-	-	-	-	**Qualifying features:** Overwintering waterfowl. **Consideration of likely significant effects:** Site is primarily terrestrial and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Foula	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding tern, seabirds and diver. Seabird assemblage. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								features present (breeding red throated diver which may forage in adjacent marine waters and breeding seabirds), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Papa Stour	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding tern and waders. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding tern which feed in adjacent marine waters), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Ronas Hill-North Roe and Tingon	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding diver, skua and birds of prey. **Consideration of likely significant effects:** Site is primarily terrestrial and conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding red throated diver which may forage in adjacent marine waters), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Ramna Stacks and Gruney	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding seabirds. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding Leach's storm petrels which feed in adjacent waters and more distant), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Otterswick and Graveland	✓	-		✓	-	-	-	**Qualifying features:** Breeding diver. **Consideration of likely significant effects:** Site is primarily terrestrial and conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding red throated diver which may forage in adjacent marine waters), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Hermaness, Saxa Vord and Valla Field	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding diver, seabirds and skua. Seabird assemblage. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding red throated diver which may forage in adjacent marine waters and breeding seabirds), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Fetlar	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding tern, waders and skua. Seabird assemblage.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								Consideration of likely significant effects: Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds and tern), although mitigation would be possible. The site is on the eastern side of Shetland and is unlikely to be impacted by spills from the Blocks although birds foraging from the site could in theory be impacted. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Noss	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding seabirds and skua. Seabird assemblage. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible. The site is on the eastern side of Shetland and is unlikely to be impacted by spills from the Blocks although birds foraging from the site could in theory be impacted. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Mousa	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding tern and seabirds. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding tern and storm petrel), although mitigation would be possible. The site is on the eastern side of Shetland and is

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								unlikely to be impacted by spills from the Blocks although birds foraging from the site could in theory be impacted. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Fair Isle	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding tern, seabirds and Fair Isle wren. Seabird assemblage. **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds and tern), although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
ORKNEY								
Pentland Firth Islands	✓	-	-	-	-	-	✓	**Qualifying features:** Breeding tern **Consideration of likely significant effects:** Site is remote from Blocks (200km) and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Section 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Switha	-	✓	-	-	-	-	-	**Qualifying features:** Overwintering waterfowl. **Consideration of likely significant effects:** Due to the primarily

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								terrestrial nature of the site, distance from Blocks (*ca.* 190km linear distance) and qualifying feature present (overwintering geese), site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Orkney Mainland Moors	✓	✓	-	✓	-	-	✓	**Qualifying features:** Breeding birds of prey and diver, overwintering bird of prey. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 160km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding red-throated diver which forage in adjacent marine waters), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Hoy	✓	-	-	-	-	-	✓	**Qualifying features:** Breeding bird of prey, diver and skua. Seabird assemblage. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 180km) and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								effects. **Appropriate Assessment:** See Section 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Marwick Head	✓	-	-	✓	-	-	✓	**Qualifying features:** Breeding seabirds. Seabird assemblage. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 160km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Rousay	✓	-	-	✓	-	-	✓	**Qualifying features:** Breeding tern. Seabird assemblage. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 145km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding tern and seabirds), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								project plans are known.
West Westray	✓	-	-	✓	-	-	✓	**Qualifying features:** Breeding terns and seabirds. Seabird assemblage. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 130km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Papa Westray (North Hill and Holm)	✓	-	-	✓	-	-	✓	**Qualifying features:** Breeding tern and skua. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 125km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding tern and skua), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Calf of Eday	✓	-	-	✓	-	-	✓	**Qualifying features: S**eabird assemblage.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								Consideration of likely significant effects: Site is remote from Blocks (*ca.* 140km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
East Sanday Coast	-	✓	-	✓	-	-	✓	**Qualifying features:** Overwintering waders. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 130km) and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (over-wintering waders), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Auskerry	✓	-	-	✓	-	-	✓	**Qualifying features:** Breeding terns and seabirds. **Consideration of likely significant effects:** Site is remote from Blocks (*ca.* 160km). Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding storm petrel and tern), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Copinsay	✓	-	-	✓	-	-	✓	**Qualifying features:** Seabird assemblage. **Consideration of likely significant effects:** Site is remote (*ca.* 175km) from Blocks. Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however distance from the Blocks means that population integrity of the qualifying species will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Sule Skerry and Sule Stack	✓	-	-	✓	-	-	-	**Qualifying features:** Breeding seabirds. Seabird assemblage. **Consideration of likely significant effects:** Site is remote (*ca.* 190km) from Blocks. Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								Appropriate Assessment: See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
NORTH COAST OF SCOTLAND								
North Rona and Sula Sgeir SPA	✓	-	-	-	-	-	-	**Qualifying features:** Breeding seabirds and gulls. Seabird assemblage. **Consideration of likely significant effects:** Site is remote (*ca.* 250km) from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Cape Wrath	✓	-	-	-	-	-	-	**Qualifying features:** Seabird assemblage. **Consideration of likely significant effects:** Site is remote (*ca.* 250km) from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
North Sutherland Coastal Islands	-	✓	-	-	-	-	-	**Qualifying features:** Overwintering waterfowl. **Consideration of likely significant effects:** Due to the primarily terrestrial nature of the site, distance from Blocks (*ca.* 240km) and qualifying feature present (overwintering geese), site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
North Caithness Cliffs	✓	-	-	-	-	-	✓	**Qualifying features:** Breeding seabirds, peregrine **Consideration of likely significant effects:** Site is remote (*ca.* 200km) from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. It is noted that this site could potentially be influenced by renewable energy

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								developments in the Pentland Firth marine energy strategic area; however, distance from the Blocks means that population integrity of the qualifying species (breeding seabirds) will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Section 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Caithness and Sutherland Peatlands	✓	-	-	-	-	-	✓	**Qualifying features:** Breeding diver, birds of prey, waterfowl and waders. **Consideration of likely significant effects:** Site is remote (*ca.* 215km) from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth marine energy strategic area; however, population integrity of the qualifying species (breeding red-throated diver which forage in adjacent marine waters) will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Section 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Caithness Lochs	-	✓	-	-	-	-	-	**Qualifying features:** Overwintering waterfowl. **Consideration of likely significant effects:** Due to the terrestrial nature of the site, distance from Blocks (at least *ca.* 215km) and the features present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
MORAY FIRTH AND ABERDEENSHIRE								
East Caithness Cliffs	✓	-	-	-	-	-	-	**Qualifying features:** Breeding birds of prey, seabirds and gulls. Seabird assemblage.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								Consideration of likely significant effects: Site is remote (*ca.* 230km) from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect

Notes: 1 ✓ denotes feature present; 2 ✓ denotes vulnerability to effect

B2 Coastal and marine Special Areas of Conservation

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
SHETLAND							
The Vadills	✓	-	-	-	-	-	**Qualifying features:** Coastal lagoons **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features, although features not considered particularly sensitive to spills and mitigation would be possible. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Papa Stour	✓	-	-	-	-	-	**Qualifying features:** Reefs, sea caves **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features, although features not considered particularly sensitive to spills and mitigation would be possible. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Tingon	✓	-	-	-	-	-	**Qualifying features:** Bogs **Consideration of likely significant effects:** Site has limited marine component and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Ronas Hill - North Roe	✓	-	-	-	-	-	**Qualifying features:** Standing freshwater, heath, bogs, heath, scree **Consideration of likely significant effects:** Site has limited marine component and its conservation objectives would not be undermined by

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Sullom Voe	✓	-	✓	-	-	-	**Qualifying features:** Inlets and bays, coastal lagoons, reefs **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could affect the qualifying features (inlets and bays) although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Hascosay	✓	✓	✓	-	-	-	**Qualifying features:** Otter **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could affect the species features, although mitigation would be possible. **Appropriate Assessment:** See Section 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Yell Sound Coast	-	✓	✓	-	✓	✓	**Qualifying features:** Otter, harbour seal **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could affect the species features (harbour seal and otter), although mitigation would be possible. Certain activities (i.e. seismic surveys) may cause temporary acoustic disturbance to the harbour seals, although mitigation would be possible. **Appropriate Assessment:** See Sections 6.4, 7.3 and 8. Further, project

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							specific mitigation measures would be defined by subsequent HRA once project plans are known.
Keen of Hamar	✓	-	-	-	-	-	**Qualifying features:** Grasslands, scree, heath **Consideration of likely significant effects:** Site has limited marine component and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
North Fetlar	✓	-	-	-	-	-	**Qualifying features:** Heath, fens **Consideration of likely significant effects:** Site has limited marine component and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Mousa	✓	✓	✓	-	✓	✓	**Qualifying features:** Reefs, sea caves, harbour seal **Consideration of likely significant effects:** Site is remote from Blocks and conservation objectives would not be undermined by emissions or discharges from routine operations. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (harbour seal), although effects on conservation status are unlikely (see Sections 6.2 and 6.3). In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the feature present, although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments to the west of Shetland; however, population integrity of the qualifying species (harbour seal) will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 6.4, 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Fair Isle	✓	-	-	-	-	-	**Qualifying features:** Sea cliffs, heaths

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							Consideration of likely significant effects: Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features (sea cliffs), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
ORKNEY							
Hoy	✓	-	-	-	-	-	**Qualifying features:** Sea cliffs, standing freshwater, heath, bog, heath, fens, rocky slopes **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features (sea cliffs), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Loch of Stenness	✓	-	-	-	-	-	**Qualifying features:** Coastal lagoons **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the feature, although feature not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Stromness Heaths and Coasts	✓	-	-	-	-	-	**Qualifying features:** Sea cliffs, heath, fens **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							(sea cliffs), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Faray and Holm of Faray	-	✓	✓	-	✓	✓	**Qualifying features:** Grey seal **Consideration of likely significant effects:** Site is remote from Blocks and conservation objectives would not be undermined by emissions or discharges from routine operations. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (grey seal), although effects on conservation status are unlikely (see Sections 6.2 and 6.3). In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the feature present, although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth areas; however, population integrity of the qualifying species (grey seal) will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 6.4, 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Sanday	✓	✓	✓	-	✓	✓	**Qualifying features:** Reefs, sandbanks, mudflats and sandflats, harbour seal **Consideration of likely significant effects:** Site is remote from Blocks and conservation objectives would not be undermined by emissions or discharges from routine operations. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (harbour seal), although effects on conservation status are unlikely (see Sections 6.2 and 6.3). In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect some of the features present (intertidal sand and mudflats, harbour seal), although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth areas; however, population integrity of the qualifying species (harbour seal) will not be

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 6.4, 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
NORTH COAST OF SCOTLAND							
North Rona	✓	✓	✓	-	✓	✓	**Qualifying features:** Sea cliffs, sea caves, reefs, grey seal **Consideration of likely significant effects:** Site is remote from Blocks and conservation objectives would not be undermined by emissions or discharges from routine operations. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (grey seal) which is known to travel to Shetland and beyond, although effects on conservation status are unlikely (see Sections 6.2 and 6.3). In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled oil could theoretically affect the feature present, although mitigation would be possible. It is noted that this site could potentially be influenced by renewable energy developments in the Pentland Firth areas; however, the conservation objectives and status of the qualifying species (grey seal) will not be affected by foreseeable in-combination effects. **Appropriate Assessment:** See Sections 6.4, 7.3 and 8. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Cape Wrath	✓	-	-	-	-	-	**Qualifying features:** Sea cliffs **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features (sea cliffs), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Durness	✓	✓	-	-	-	-	**Qualifying features:** Coastal dunes, standing freshwater, grasslands,

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							limestone pavements, heath, fens **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features (dunes), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Invernaver	✓	-	-	-	-	-	**Qualifying features:** Coastal dunes, heath, grasslands, coastal dunes, fens **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features (dunes), although features not considered particularly sensitive to spills **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Strathy Point	✓	-	-	-	-	-	**Qualifying features:** Sea cliffs **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features (sea cliffs), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
MORAY FIRTH AND ABERDEENSHIRE							
East Caithness Cliffs	✓	-	-	-	-	-	**Qualifying features:** Sea cliffs **Consideration of likely significant effects:** Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the features

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							(sea cliffs), although features not considered particularly sensitive to spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect

Notes: 1 ✓ denotes feature present; 2 ✓ denotes vulnerability to effect

B3 Offshore Special Areas of Conservation

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Pobie Bank Reef cSAC	✓	-	-	-	-	-	**Qualifying features:** Reefs **Consideration of likely significant effects**: The Blocks on offer are some distance from the site (85km), and no physical effects are predicted. Oil spills from any of the Blocks would be unlikely to undermine site conservation objectives/status as the features of interest are benthic and not considered particularly sensitive to spills (see Section 7.3). **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Solan Bank Reef cSAC	✓	-	-	-	-	-	**Qualifying features:** Reefs **Consideration of likely significant effects**: The Blocks on offer are some distance from the site (207km), and no physical effects are predicted. Oil spills from any of the Blocks would be unlikely to undermine site conservation objectives/status as the features of interest are benthic and not considered particularly sensitive to spills (see Section 7.3). **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
Wyville Thomson Ridge SCI	✓	-	-	-	-	-	**Qualifying features:** Reefs **Consideration of likely significant effects**: The Blocks on offer are some distance from the site, and no physical effects are predicted. Oil spills from any of the Blocks would be unlikely to undermine site conservation objectives/status as the features of interest are benthic and not considered particularly sensitive to spills (see Section 7.3). **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect

B4 Riverine Special Areas of Conservation

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Foinaven	✓	✓	-	-	-	-	**Qualifying features:** Freshwater pearl mussel **Consideration of likely significant effects:** Site is remote from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. **Appropriate Assessment:** No foreseeable interaction between plan activities and site negates likely significant effect
River Borgie	-	✓	✓	-	✓	-	**Qualifying features:** Freshwater pearl mussel, Atlantic salmon **Consideration of likely significant effects:** Site is remote from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the qualifying features although only if the qualifying feature (salmon) is present in shallow coastal areas and mitigation would be possible. Certain activities (i.e. seismic survey) in any of the Blocks could cause temporary acoustic disturbance to the qualifying feature (salmon) outside the site boundaries although mitigation would be possible. **Appropriate Assessment:** See Sections 6.4 and 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
River Naver	-	✓	✓	-	✓	-	**Qualifying features:** Freshwater pearl mussel, Atlantic salmon **Consideration of likely significant effects:** Site is remote from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the qualifying features although only if the qualifying feature (salmon) is present in shallow coastal areas and mitigation would be possible. Certain activities (i.e. seismic survey) in any of the Blocks could cause temporary acoustic disturbance to the qualifying feature (salmon) outside the site

Site name	Features present[1]		Vulnerability to effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
							boundaries although mitigation would be possible. **Appropriate Assessment:** See Sections 6.4 and 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
River Thurso	-	✓	✓	-	✓	-	**Qualifying features:** Atlantic salmon **Consideration of likely significant effects:** Site is remote from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the qualifying feature although only if present in shallow coastal areas and mitigation would be possible. Certain activities (i.e. seismic survey) in any of the Blocks could cause temporary acoustic disturbance to the qualifying feature outside the site boundaries although mitigation would be possible. **Appropriate Assessment:** See Sections 6.4 and 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.
Berriedale & Langwell Waters	-	✓	✓	-	✓	-	**Qualifying features:** Atlantic salmon **Consideration of likely significant effects:** Site is remote from Blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill from any of the Blocks, weathered spilled crude oil could theoretically affect the qualifying features although only if present in shallow coastal areas and mitigation would be possible. Certain activities (i.e. seismic survey) in any of the Blocks could cause temporary acoustic disturbance to the qualifying feature outside the site boundaries although mitigation would be possible. **Appropriate Assessment:** See Sections 6.4 and 7.3. Further, project specific mitigation measures would be defined by subsequent HRA once project plans are known.

Notes: 1 ✓ denotes feature present; 2 ✓ denotes vulnerability to effect

Appendix C – Detailed information on sites where the potential for effects have been identified

C1 Special Protection Areas

The following tables provide detailed information of the relevant sites, including full listing of their qualifying features. Where available, information is provided on the assessed condition of the qualifying features, as stated on the SNH sitelink website.

Site Name: Sumburgh Head SPA	
Location	Grid Ref: HU411085 (central point) Latitude 59º51'36"N Longitude 01º15'59"W
Area (ha)	2477.91
Summary	Sumburgh Head is located at the most southern tip of the Shetland mainland in northern Scotland. The site comprises boulder-strewn beaches and cliffs up to 100 m high along the east side of Sumburgh Head. The site is of importance as a breeding area for several species of seabirds, including terns, auks and gulls. These seabirds feed outside the SPA, both in the waters immediately around Sumburgh Head, and further away.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Arctic tern *Sterna paradisaea*, 700 pairs representing at least 1.6% of the breeding population in Great Britain.	
Assemblage qualification: A seabird assemblage of international importance The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds During the breeding season, the area regularly supports 35,000 individual seabirds (Count period ongoing) including: Guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, fulmar *Fulmarus glacialis*, Arctic tern *Sterna paradisaea*.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Foula SPA	
Location	Grid Ref: HT957388 (central point) Latitude 60º08'03"N Longitude 02º04'43"W
Area (ha)	7,985.49
Summary	Foula is the most westerly of the Shetland Islands, which are situated to the north of the Scottish mainland and Orkney. It lies 20 km west of the Shetland mainland and is the most isolated inhabited island in the UK. The island is formed of Old Red Sandstone with a low-lying eastern side rising steeply to a central ridge and terminating on the western coast in sea-cliffs, including the second highest sea-cliff in the UK (The Kame at 317 m). The cool oceanic climate has produced extensive peat formation and much of the island is covered in different types of bog vegetation, largely dominated by hare's-tail cottongrass *Eriophorum vaginatum* and crowberry *Empetrum nigrum*, although with very little heather *Calluna vulgaris*. At higher altitudes the vegetation becomes sub-maritime, whilst near cliff-tops it is highly spray-influenced. The island is important for a wide range of breeding seabirds, with different species nesting in different parts of the island. It is one of only seven known nesting localities in the EU for Leach's petrel *Oceanodroma leucorhoa.* The seabirds feed outside the SPA in nearby waters, as well as more distantly in the North Atlantic.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Arctic tern *Sterna paradisaea*, 1,100 pairs representing at least 2.5% of the breeding population in Great Britain.

Leach's storm-petrel *Oceanodroma leucorhoa*, 50 pairs representing at least 0.1% of the breeding population in Great Britain.

Red-throated diver *Gavia stellata*, 11 pairs representing at least 1.2% of the breeding population in Great Britain.

Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

During the breeding season:
Great skua *Catharacta skua*, 2,170 pairs representing at least 16.0% of the breeding World population.
Guillemot *Uria aalge*, 25,125 pairs representing at least 1.1% of the breeding East Atlantic population.
Puffin *Fratercula arctica*, 48,000 pairs representing at least 5.3% of the breeding population.
Shag *Phalacrocorax aristotelis*, 2,400 pairs representing at least 1.9% of the breeding Northern Europe population.

Assemblage qualification: A seabird assemblage of international importance
The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 250,000 individual seabirds including: Leach's storm-petrel *Oceanodroma leucorhoa*, razorbill *Alca torda*, kittiwake *Rissa tridactyla*, Arctic skua *Stercorarius parasiticus*, fulmar *Fulmarus glacialis*, puffin *Fratercula arctica*, guillemot *Uria aalge*, great skua *Catharacta skua*, shag *Phalacrocorax aristotelis*, Arctic tern *Sterna paradisaea*.

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Papa Stour SPA	
Location	Grid Ref: HU166613 (central point) Latitude 60º08'30"N Longitude 01º42'00"W
Area (ha)	569.03
Summary	Papa Stour lies on the west coast of mainland Shetland in northern Scotland. The SPA comprises the northern and western parts of Papa Stour and consists of rocky hillsides rising to about 90 m, a number of lochs and a few offshore skerries. The main vegetation is a lichen-rich heath that has developed on substrates that formerly consisted of peat and turf. The island is an important breeding site for Arctic tern *Sterna paradisaea* and ringed plover *Charadrius hiaticula*. The terns feed outside the SPA in the waters around the islands.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Arctic tern *Sterna paradisaea*, 1,000 pairs representing at least 2.3% of the breeding population in Great Britain.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Ronas Hill – North Roe and Tingon SPA	
Location	Grid Ref: HU320852 (central point) Latitude 60º33'00"N Longitude 01º25'00"W
Area (ha)	5,470.2
Summary	Ronas Hill – North Roe and Tingon SPA is located in the north mainland of Shetland in northern Scotland. The site comprises two adjacent headlands separated by the large Ronas Voe. Most of the site is composed of active blanket bog with numerous lochans and pools that support a typical peatland avifauna. The flatter parts of Tingon and North Roe have many pools and acidic lochans set within an open landscape of blanket bog and maritime heath. The area holds some of the highest-quality blanket bog in Shetland, which is floristically rich and intact. The site is of importance for breeding red-throated diver *Gavia stellata* and merlin *Falco columbarius*.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Merlin *Falco columbarius*, 6 pairs representing at least 0.5% of the breeding population in Great Britain

Red-throated diver *Gavia stellata*, 50 pairs representing at least 5.3% of the breeding population in Great Britain.

Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

During the breeding season:
Great skua *Catharacta skua*, representing at least 0.9% of the breeding World population.

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Ramna Stacks and Gruney SPA	
Location	Grid Ref: HU381967 (central point) Latitude 60º39'10"N Longitude 01º18'10"W
Area (ha)	11.59
Summary	Ramna Stacks and Gruney lie north of mainland Shetland in the north of Scotland. With the exception of Gruney, where guano-enriched maritime grassland occurs, these rocky islands support little or no vegetation. They are of importance as a site for breeding seabirds, particularly as one of only seven known nesting localities in the EU for Leach's petrel *Oceanodroma leucorhoa*. The nesting seabirds using the site feed outside the SPA in surrounding and more distant marine areas.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Leach's storm-petrel *Oceanodroma leucorhoa*, 22 pairs representing at least 0.0% of the breeding population in Great Britain.

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Otterswick and Graveland SPA	
Location	Grid Ref: HU 452940 (central point) Latitude 60º 35'42" N Longitude 01º 08'07" W
Area (ha)	2,241.41
Summary	Otterswick & Graveland Special Protection Area comprises two areas of open moorland with numerous pools and lochans on Yell, Shetland. Otterswick is located in the south of Yell, while Graveland is a peninsula on the west of Yell. The site rises from sea-level on Graveland, to 205m at Ward of Otterswick. Inland areas are dominated by blanket bog, with some stretches of dry heather moorland. The blanket bog is variable in quality, with considerable areas of eroded peat, especially on the eastern side of Otterswick. However, some of the erosion is re-vegetating. A band of maritime grassland extends along the coastal stretch of the Graveland peninsula.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Red-throated diver *Gavia stellata* (average of 26 pairs during 1992-99, 3% of the British population).	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Hermaness, Saxa Vord and Valla Field SPA	
Location	Grid Ref: HP598166 (central point) Latitude 60º49'42"N Longitude 00º54'05"W
Area (ha)	6,833.04
Summary	Hermaness, Saxa Vord and Valla Field SPA is located at the northernmost part of the Shetland island of Unst, Scotland, the most northerly part of the UK. The vegetation of Hermaness is mainly *Calluna/Eriophorum* blanket bog, with acidic grassland together with small oligotrophic lochans and streams. More species-rich closely grazed, maritime grasslands line the cliff tops. The cliffs of Hermaness, Saxa Vord and the off-lying stacks (including Muckle Flugga) are mostly 100-200 m high. The site is important for a number of breeding seabird species that nest on both the extensive cliffs as well as on the heathland and grassland parts of the site. The seabirds feed outside the SPA in nearby waters, as well as more distantly elsewhere in the North Atlantic.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Red-throated diver *Gavia stellata*, 28 pairs representing at least 3.0% of the breeding population in Great Britain.

Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

During the breeding season:
Gannet *Morus bassanus*, 12,000 pairs representing at least 4.6% of the breeding North Atlantic population.
Great Skua *Catharacta skua*, 630 pairs representing at least 4.6% of the breeding World population.
Puffin *Fratercula arctica*, 25,400 pairs representing at least 2.8% of the breeding population.

Assemblage qualification: A seabird assemblage of international importance
The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 152,000 individual seabirds including: Guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, shag *Phalacrocorax aristotelis*, fulmar *Fulmarus glacialis*, puffin *Fratercula arctica*, great skua *Catharacta skua*, gannet *Morus bassanus*.

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Fetlar SPA	
Location	Grid Ref: HU627917 (central point) Latitude 60º36'14"N Longitude 00º51'20"W
Area (ha)	16,962.16
Summary	Fetlar is one of the northernmost of the Shetland Islands in northern Scotland. The SPA comprises a range of habitats including species-rich heathland, marshes and lochans, cliffs and rocky shores. The principal areas of importance for birds are the northernmost part of the island and the south-western peninsula of Lamb Hoga. Most of the north of the island is vegetated by heathland and relatively species-poor grasslands owing to the influence of underlying serpentine-base-rich rocks. In wetter areas, small lochs and sedge-rich mires are present. Around the coasts are floristically rich maritime grasslands and heathlands. Lamb Hoga has heather moorland with areas of cottongrass *Eriophorum* spp. dominated blanket bog. Fetlar SPA is of importance for a number of northern breeding waders, as well as breeding seabirds, which nest especially on the moorlands as well as in some of the other wetlands.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Red-necked pharalope *Pharalobus lobatus*, 80% of the Great Britain breeding population. Arctic tern *Sterna paradisaea*, 1% of the Great Britain breeding population.	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **During the breeding season:** 22,000 seabirds, including great skua *Catharacta skua,* fulmar *Fulmarus glacialis,* red-necked pharalope *Phalaropus lobatus,* Arctic skua *Stercorarius parasiticus,* Arctic tern *Sterna paradisaea.*	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Noss SPA	
Location	Grid Ref: HU549400 (central point) Latitude 60º08'30"N Longitude 01º00'44"W
Area (ha)	3,338.34
Summary	Noss is located on the east coast of the island of Bressay, to the east of mainland Shetland in northern Scotland. The site comprises high cliffs of Old Red Sandstone that reach 180 m. The steeper eastern part of the island is covered with maritime grassland and *Calluna/Eriophorum* heath, whilst lower land to the west is semi-intensified grassland. The horizontal bedding planes of the sandstone cliffs result in a high density of ledges suitable for nesting seabirds and accordingly the site supports large numbers of auks, gulls and gannet *Morus bassanus*. On moorland areas large numbers of great skua *Catharacta skua* breed. The seabirds nesting on Noss feed outside the SPA in the immediately surrounding waters, as well as further away in the North Sea.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Red-throated diver *Gavia stellata*, 28 pairs representing at least 3.0% of the breeding population in Great Britain.	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **During the breeding season:** Gannet *Morus bassanus*, 7,310 pairs representing at least 2.8% of the breeding North Atlantic population. Great skua *Catharacta skua*, 410 pairs representing at least 3.0% of the breeding World population. Guillemot *Uria aalge*, 30,619 pairs representing at least 1.4% of the breeding East Atlantic population. **Assemblage qualification: A seabird assemblage of international importance** The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 100,000 individual seabirds including: Puffin *Fratercula arctica*, kittiwake *Rissa tridactyla*, fulmar *Fulmarus glacialis*, guillemot *Uria aalge*, great skua *Catharacta skua*, gannet *Morus bassanus*.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Mousa SPA	
Location	Grid Ref: HU460240 (central point) Latitude 60º00'00"N Longitude 01º10'20"W
Area (ha)	209.8
Summary	Mousa is a low-lying, grassy island 1km off the south-east coast of Shetland Mainland. It supports acidic grassland and some maritime vegetation and is of outstanding nature conservation and scientific interest for its breeding seabirds. The boundary of the site follows that of Mousa SSSI.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Storm petrel *Hydrobates pelagicus* (4,750 pairs, 6% of GB & 2% of total world breeding populations) and Arctic tern *Sterna paradisaea* (up to 1,000 pairs, 1% of GB).

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Fair Isle SPA	
Location	Grid Ref: HZ216724 (central point) Latitude 59º32'15"N Longitude 01º37'00"W
Area (ha)	6,824.4
Summary	Fair Isle is located in the North Sea, halfway between the Shetland mainland and the Orkney Islands in northern Scotland. It is partly composed of Old Red Sandstone that has weathered to produce a greatly indented coastline with many geos, stacks and crags. The island is of major importance as a breeding area for seabirds, including skuas, terns, gulls and auks. It is also notable for its endemic race of wren *Troglodytes troglodytes fridariensis.* The seabirds nest both on the cliffs and crags around the island as well as on moorland and maritime grassland areas, and feed in the waters around the island, outside the SPA. The SPA includes the entire coastline of the island together with an extensive area of moorland and grassland in the north of the island.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Arctic tern *Sterna paradisaea*, 1,120 pairs representing at least 2.5% of the breeding population in Great Britain (5 year mean, 1993-1997) [favourable maintained] Fair Isle wren *Troglodytes troglodytes fridariensis*, 37 individuals representing 100.0% of the breeding population in Great Britain (Count, as at 1997) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **During the breeding season:** Guillemot *Uria aalge*, 25,165 pairs representing at least 1.1% of the breeding East Atlantic population (Count as at 1994) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds Assemblage qualification: A seabird assemblage of international importance. During the breeding season, the area regularly supports 180,000 individual seabirds including: puffin *Fratercula arctica*, razorbill *Alca torda*, kittiwake *Rissa tridactyla*, great skua *Catharacta skua*, Arctic skua *Stercorarius parasiticus*, shag *Phalacrocorax aristotelis*, gannet *Morus bassanus*, fulmar *Fulmarus glacialis*, guillemot *Uria aalge*, Arctic tern *Sterna paradisaea* [all favourable maintained, except shag: unfavourable recovering]	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Orkney Mainland Moors SPA	
Location	Grid Ref: HY351223 (central point) Latitude 59º05'00"N Longitude 03º08'00"W
Area (ha)	4,444.35
Summary	Orkney Mainland Moors SPA comprises four areas of moorland on the mainland of Orkney. The predominant habitats include extensive areas of blanket bog, acid grassland, wet and dry heath, raised-mire and calcareous valley mire. The presence of extensive moorland provides nesting opportunities for an assemblage of moorland breeding birds, including hen harrier and short-eared owl. Sheltered river valleys and dales support willow *Salix* spp. scrub, tall-herb and flush vegetation, and there are several scattered oligotrophic lochans present on part of the SPA, which provide important breeding areas for red-throated diver.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Hen harrier *Circus cyaneus*, 30 pairs representing at least 6.0% of the breeding population in Great Britain (as of 1998) [favourable maintained]
Red-throated diver *Gavia stellata*, 15 pairs representing at least 1.6% of the breeding population in Great Britain (1994-1996) [favourable maintained]
Short-eared owl *Asio flammeus*, 20 pairs representing at least 2.0% of the breeding population in Great Britain (RSPB mid 1990s est) [favourable maintained]

Overwinter:
Hen harrier *Circus cyaneus*, 13 individuals representing at least 1.7% of the wintering population in Great Britain (Count mean (1994-98)) [favourable maintained]

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Marwick Head SPA	
Location	Grid Ref: HY223253 (central point) Latitude 59º06'30"N Longitude 03º21'27"W
Area (ha)	475.58
Summary	Marwick Head lies on the west coast of the island of Mainland in the Orkney archipelago of northern Scotland. The site comprises a 2 km section of high, eroded Old Red Sandstone cliffs rising to 85 m and backed by cliff-top maritime grassland. The site is of importance as a nesting area for large numbers of guillemot *Uria aalge* and kittiwake *Rissa tridactyla*. These species feed outside the SPA in surrounding marine areas.
Qualifying features for which the site is designated [condition]:	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **During the breeding season:** Guillemot *Uria aalge*, 24,388 pairs representing up to 1.1% of the breeding East Atlantic population.	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds ***Assemblage qualification: A seabird assemblage of international importance.*** The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 75,000 individual seabirds including: Kittiwake *Rissa tridactyla*, guillemot *Uria aalge*.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Rousay SPA	
Location	Grid Ref: HY399338 (central point) Latitude 59º11'14"N Longitude 03º03'09"W
Area (ha)	5,483.37
Summary	Rousay is an island off the north-east coast of the island of Mainland in the Orkney archipelago, in northern Scotland. The site is composite and consists of two parts located at the north-west and north-east ends of the island. Here, sea-cliffs grade inland to areas of maritime heath and grassland. The maritime heath contains numerous base-rich flushes characterised by Black Bog-rush *Schoenus nigricans* and various sedges *Carex* spp. and grasses. The maritime heath also supports colonies of the nationally scarce Scottish primrose *Primula scotica*. The site holds a diverse assemblage of breeding seabirds, including terns, auks, gulls and skuas. The nesting seabirds feed in the waters around Rousay outside the SPA, as well as further away.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Arctic tern *Sterna paradisaea*, 1,000 pairs representing at least 2.3% of the breeding population in Great Britain.	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds ***Assemblage qualification: A seabird assemblage of international importance.*** The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 30,000 individual seabirds (Three year mean, 1986-1988) including: Guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, Arctic skua *Stercorarius parasiticus*, fulmar *Fulmarus glacialis*, Arctic tern *Sterna paradisaea*.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: West Westray SPA	
Location	Grid Ref: HY401470 (central point) Latitude 59º18'21"N Longitude 03º03'07"W
Area (ha)	3,781.29
Summary	The SPA is located on the west coast of the island of Westray, one of the most northerly of the Orkney islands in northern Scotland. The site comprises an 8 km length of Old Red Sandstone cliffs, together with adjoining areas of species-rich maritime grassland and heath. The area is rich in cliff-top plants including the nationally scarce Scottish primrose *Primula scotica*, sea plantain *Plantago maritima*, and spring squill *Scilla verna*. The cliffs support large colonies of breeding auks and kittiwake *Rissa tridactyla*, whilst the grassland and heathland areas support breeding colonies of skuas and terns. The seabirds feed in the surrounding waters outside the SPA.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Arctic tern *Sterna paradisaea*, 1,200 pairs representing at least 2.7% of the breeding population in Great Britain.	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **During the breeding season:** Guillemot *Uria aalge*, 28,274 pairs representing at least 1.3% of the breeding East Atlantic population. **Assemblage qualification: A seabird assemblage of international importance** The area qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 120,000 individual seabirds including: Razorbill *Alca torda*, kittiwake *Rissa tridactyla*, Arctic skua *Stercorarius parasiticus*, fulmar *Fulmarus glacialis*, guillemot *Uria aalge*, Arctic tern *Sterna paradisaea*.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Papa Westray (North Hill and Holm) SPA	
Location	Grid Ref: HY501549 (central point) Latitude 59º22'40"N Longitude 02º52'45"W
Area (ha)	245.71
Summary	Papa Westray is a small island lying close to Westray in the northern Orkney islands in Scotland. The island rises to 48 m above sea level at North Hill and is surrounded by a rocky coastline backing onto maritime sedge heath. Halophytic communities of plants typify the grassland immediately above the shore, grading inland to maritime sedge heath with a few small pools. The site supports a wide variety of plants, including the nationally scarce Scottish primrose *Primula scotica*. The Holm is a small, low-lying island of 48 ha off the east coast of Papa Westray dominated by a rocky coastline and maritime grassland. The islands are an important breeding site for both Arctic tern *Sterna paradisaea* and Arctic skua *Stercorarius parasiticus*. The terns feed outside the SPA in the waters surrounding the islands.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Arctic tern *Sterna paradisaea*, 1,950 pairs representing at least 4.4% of the breeding population in Great Britain.	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Calf of Eday SPA	
Location	Grid Ref: HY584394 (central point) Latitude 59º14'24"N Longitude 02º43'48"W
Area (ha)	2,668.91
Summary	The Calf of Eday is a small, uninhabited island located to the north of the island of Eday in the Orkney archipelago. The island has a rocky coastline with cliffs on the north and east coasts. The dominant vegetation on the island is dry dwarf-shrub heath dominated by heather, with smaller areas of wet heath, semi-improved grassland and coastal grassland. The site is of importance as a nesting area for breeding seabirds, which feed in surrounding waters outside the SPA. Gulls and cormorant nest in the dry heath and grassland areas, whilst fulmar, kittiwake and auks nest on the cliffs.

Qualifying features for which the site is designated [condition]:

Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

During the breeding season:
Guillemot *Uria aalge*, 24,388 pairs representing up to 1.1% of the breeding East Atlantic population (as of 1991) [unfavourable declining]

Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds
Assemblage qualification: A seabird assemblage of international importance.

During the breeding season, the area regularly supports 30,000 individual seabirds (as of 1997) including: guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, great black-backed gull *Larus marinus*, cormorant *Phalacrocorax carbo*, fulmar *Fulmarus glacialis* [unfavourable declining, except great black-backed gull and fulmar: favourable maintained]

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: East Sanday Coast SPA	
Location	Grid Ref: HY676423 (central point) Latitude 59º16'00"N Longitude 02º34'00"W
Area (ha)	1,515.23
Summary	East Sanday Coast SPA is located on the island of Sanday in the Orkney Islands of northern Scotland. The site comprises a 55km stretch of coast, and consists of both rocky and sandy sections. The coastline supports internationally important populations of wintering waders.
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **Over winter:** Bar-tailed godwit *Limosa lapponica*, 600 individuals representing at least 1.1% of the wintering population in Great Britain (Winter peak mean 1991/2-1993/4) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **Over winter:** Purple sandpiper *Calidris maritima*, 840 individuals representing at least 1.7% of the wintering Eastern Atlantic - wintering population (winter peak means) [unfavourable declining] Turnstone *Arenaria interpres*, 1,400 individuals representing at least 2.0% of the wintering Western Palearctic - wintering population (three year peak mean, 1991/2-1993/4) [unfavourable declining]	
Conservation objectives:	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

Site Name: Auskerry SPA	
Location	Grid Ref: HY674163 (central point) Latitude 59º02'00"N Longitude 02º34'00"W
Area (ha)	101.97
Summary	Auskerry is a small, uninhabited low-lying island situated 5km south of Stronsay in the Orkney Islands. The shore is a mixture of rocky platforms interspersed with low cliffs and boulder/shingle beaches. The site is important as a nesting area for a number of breeding seabirds. These birds feed outside the SPA in the waters surrounding the island, as well as more distant waters.

Qualifying features for which the site is designated [condition]:

Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season:
Arctic tern *Sterna paradisaea*, 780 pairs representing at least 1.8% of the breeding population in Great Britain (4 year mean, 1992-1995) [favourable maintained]
Storm petrel *Hydrobates pelagicus*, 3,600 pairs representing at least 4.2% of the breeding population in Great Britain (Count, as at 1995) [unfavourable declining]

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Copinsay SPA	
Location	Grid Ref: HY611015 (central point) Latitude 58º54'00"N Longitude 02º40'30"W
Area (ha)	3,607.7
Summary	Copinsay lies 4km off the east coast of Orkney Mainland. It consists of the island of Copinsay and three islets (Corn Holm, Ward Holm and Black Holm). The three holms are vegetated and a storm beach connects them to Copinsay at low water. Copinsay is formed of Old Red Sandstone with the largely horizontal bedding planes providing ideal breeding ledges for seabirds (auks and kittiwake), especially on the sheer cliffs of the southeast of Copinsay which reach to over 60m. The seabirds feed outside the SPA in the nearby waters, as well as more distantly.

Qualifying features for which the site is designated [condition]:

Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds
Assemblage qualification: A seabird assemblage of international importance.

During the breeding season, the area regularly supports 70,000 individual seabirds including: guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, great black-backed gull *Larus marinus* and fulmar *Fulmarus glacialis* [unfavourable declining, except kittiwake: unfavourable recovering; and fulmar and great black-backed gull: favourable maintained]

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Sule Skerry and Sule Stack SPA	
Location	Grid Ref: HX594215 (central point) Latitude 59º03'26"N Longitude 04º27'08"W
Area (ha)	3,909.45
Summary	The two small and remote islands of Sule Skerry and Sule Stack lie in the North Atlantic, west of Orkney. Sule Skerry is about 60 km from Orkney, while Sule Stack is another 8 km to the south-west. Sule Skerry is the larger of the two islands, covering about 16 ha, and is low-lying and covered by peaty soil with rocky outcrops. Vegetation is limited by the combination of salt spray and seabird activity. Sule Stack is a higher, bare rock with no vascular plants. The islands provide strategically placed nesting localities for large numbers of seabirds which feed in the waters off the north coast of Scotland outside the SPA. They also hold a diverse assemblage of largely pelagic species, including large numbers of petrels, auks and gannet *Morus bassanus*. It is one of only seven known nesting localities in the EU for Leach's petrel *Oceanodroma leucorhoa.*
Qualifying features for which the site is designated [condition]:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: **During the breeding season:** Storm petrel *Hydrobates pelagicus*, 1,000 pairs representing at least 1.2% of the breeding population in Great Britain.	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: ***During the breeding season:*** *Gannet Morus bassanus, 4,890 pairs representing at least 1.9% of the breeding North Atlantic population.* *Puffin Fratercula arctica, 43,380 pairs representing at least 4.8% of the breeding population.*	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds ***Assemblage qualification: A seabird assemblage of international importance.*** *During the breeding season, the area regularly supports 100,000 individual seabirds including: Leach's storm-petrel Oceanodroma leucorhoa, guillemot Uria aalge, shag Phalacrocorax aristotelis, puffin Fratercula arctica, gannet Morus bassanus, storm petrel Hydrobates pelagicus.*	
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	

C2 Special Areas of Conservation

Site Name: Sullom Voe SAC	
Location	Grid Ref: HU380757 (central point) Latitude 60º27'50"N Longitude 01º18'35"W
Area (ha)	2,698.55
Summary	Sullom Voe in the Shetland Isles is the most northerly site in the UK to be selected as a representative of large shallow inlets and bays, and it is the only Scottish example of a ria (known locally as a 'voe'). The boreal-arctic (northern) species-rich communities of Sullom Voe are restricted to Shetland voes and are not represented elsewhere in the SAC series. The intertidal sediments, confined to lagoons near the mouth of the voe are colonised by a diverse faunal community including bivalves, polychaetes and the sea cucumber *Leptosynapta inhaerens*. Poorly-mixed, muddy sediments which characterise the sublittoral are colonised by horse mussels, sea-pens *Virgularia* sp. and diverse burrowing communities. A range of bivalves, polychaetes and amphipods can also be found in the organically enriched shell-sand, gravel and muddy-sand sediments.
Qualifying features for which the site is designated [condition]:	
Annex I Habitat Primary feature: Large shallow inlets and bays [Favourable maintained] Secondary features: Coastal lagoons [Favourable maintained], reefs [Favourable maintained] **Annex II Species** Primary features: None Secondary features: None	
Conservation objectives:	
For Annex I Habitats To avoid deterioration of the qualifying habitats (listed above), thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying habitats that the following are maintained in the long term: • Extent of the habitats on site • Distribution of the habitats within site • Structure and function of the habitats • Processes supporting the habitats • Distribution of typical species of the habitats • Viability of typical species as components of the habitats No significant disturbance of typical species of the habitats	

Site Name: Hascosay SAC	
Location	Grid Ref: HU554925 (central point) Latitude 60º36'45"N Longitude 00º59'15"W
Area (ha)	164.92
Summary	Hascosay comprises a combination of the Annex I habitat blanket bogs and the Annex II species, otter. The blanket bog on Hascosay is remarkably intact and supports a range of shallow mud-bottomed, as opposed to *Sphagnum*-filled, hollows. A particular feature of this site is the dominance of the moss *Mnium hornum*, often accompanied by *Aulacomnium palustre* around the margins of bog pools. This combination of features is unusual in the UK. *Sphagnum fuscum* adds to the diversity of the community and is indicative of the undamaged nature of the bog.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
Primary feature: Blanket bogs [Favourable maintained]
Secondary features: None

Annex II Species
Primary features: Otter *Lutra lutra* [Unfavourable declining]
Secondary features: None

Conservation objectives:

For Annex I Habitats
To avoid deterioration of the qualifying habitat (listed above) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying habitat that the following are maintained in the long term:

- Extent of the habitat on site
- Distribution of the habitat within site
- Structure and function of the habitat
- Processes supporting the habitat
- Distribution of typical species of the habitat
- Viability of typical species as components of the habitat
- No significant disturbance of typical species of the habitat

For Annex II Species
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Yell Sound Coast SAC	
Location	Grid Ref: HU467755 (central point) Latitude 60º27'40"N Longitude 01º09'00"W
Area (ha)	1,540.55
Summary	The Yell Sound Coast SAC has the highest density of otter of sites designated on Shetland for this feature. The site consists of a complex of islands and coastline, selected to include the areas of highest otter density. The areas are characterised by low-lying peaty coastlines with large numbers of otter holts and easy access to fresh water. The adjacent marine areas have extensive algal beds which are used for foraging. The site is also the most northerly UK site selected for the common seal *Phoca vitulina*. The rocky shores and uninhabited islands and skerries within Yell Sound support a colony representing over 1% of the UK population.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
Primary feature: None
Secondary features: None

Annex II Species
Primary features: Otter *Lutra lutra* [Unfavourable declining], harbour seal *Phoca vitulina* [Unfavourable declining]
Secondary features: None

Conservation objectives:

For Annex II Species
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Mousa SAC	
Location	Grid Ref: HU462211 (central point) Latitude 60º00'00"N Longitude 01º10'20"W
Area (ha)	530.6
Summary	The exposed rocky island of Mousa lies off the east coast of Shetland Mainland and supports one of the largest groups of common seal *Phoca vitulina* in Shetland, and is one of the most northerly groups in the UK. The large rocky tidal pools on the island are of particular importance as they are frequently used by the seals for pupping, breeding and moulting, and provide shelter from the exposed conditions on the open coast. The site supports just over 1% of the UK population.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
Primary feature: None
Secondary features: Reefs, submerged or partially submerged sea caves

Annex II Species
Primary features: Harbour seal *Phoca vitulina* [unfavourable declining]
Secondary features: None

Conservation objectives:

For Annex I Habitats
To avoid deterioration of the qualifying habitats (listed above), thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.

To ensure for the qualifying habitats that the following are maintained in the long term:

- Extent of the habitats on site
- Distribution of the habitats within site
- Structure and function of the habitats
- Processes supporting the habitats
- Distribution of typical species of the habitats
- Viability of typical species as components of the habitats

No significant disturbance of typical species of the habitats

For Annex II Species
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Faray and Holm of Faray SAC	
Location	Grid Ref: HY529378 (central point) Latitude 59º13'30"N Longitude 02º49'30"W
Area (ha)	785.68
Summary	These two uninhabited islands in the northern part of Orkney support a well-established breeding colony of grey seal *Halichoerus grypus*. The seals tend to be found in areas where there is easy access from the shore, and freshwater pools on the islands appear to be particularly important. The islands support the second-largest breeding colony in the UK, contributing around 9% of annual UK pup production.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
Primary feature: None
Secondary features: None

Annex II Species
Primary features: Grey seal *Halichoerus grypus* [favourable maintained]
Secondary features: None

Conservation objectives:

For Annex II Species
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Sanday SAC	
Location	Grid Ref: HY715442 (central point) Latitude 59º17'00"N Longitude 02º30'00"W
Area (ha)	10,971.65
Summary	Sanday is a large, low-lying island in the north-east of the Orkney archipelago. Surrounded by clear, relatively shallow water, the island has a complex coastline dominated by extensive sandy beaches and sheltered inlets, interspersed with rocky headlands. Sanday is notable for the extensive subtidal bedrock reefs that surround the island and provide a habitat for dense forests of kelp. The kelp occurs to a depth of about 20m and provides a habitat for species-rich, red algal turf communities, sponges, and ascidians. The kelp beds also provide important foraging areas for harbour seal *Phoca vitulina*. The seal colony is the largest at any discrete site in Scotland with the breeding groups representing over 4% of the UK population. The north coast of Sanday is tide-swept and appears to support a richer fauna than the south coast, with a dense bryozoan/hydroid turf, dense brittlestar and horse mussel *Modiolus modiolus* beds lying in mixed sediment below the kelp zone. Crabs and brittlestars are common within crevices in the rock.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
Primary feature: Reefs [favourable maintained]
Secondary features: Sandbanks which are slightly covered by seawater all the time, mudflats and sandflats not covered by seawater at low tide [all favourable maintained]

Annex II Species
Primary features: Harbour seal *Phoca vitulina* [favourable maintained]
Secondary features: None

Conservation objectives:

For Annex I Habitats
To avoid deterioration of the qualifying habitats (listed above), thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.

To ensure for the qualifying habitats that the following are maintained in the long term:

- Extent of the habitats on site
- Distribution of the habitats within site
- Structure and function of the habitats
- Processes supporting the habitats
- Distribution of typical species of the habitats
- Viability of typical species as components of the habitats
- No significant disturbance of typical species of the habitats

For Annex II Species
To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: North Rona SAC	
Location	Grid Ref: HW811327 (central point) Latitude 59º07'30"N Longitude 05º49'30"W
Area (ha)	612.88
Summary	North Rona is a remote and very exposed island in the North Atlantic off the north-west tip of mainland Scotland. The islands are rarely disturbed by human activities in the breeding season. Grey seal *Halichoerus grypus* are found over much of the island and use many of the submerged sea caves that are found around the coast. North Rona supports the third-largest breeding colony in the UK, representing some 5% of annual UK pup production.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
Primary feature: None
Secondary features: Reefs, Vegetated sea cliffs of the Atlantic and Baltic coasts [favourable maintained], Submerged or partially submerged sea caves

Annex II Species
Primary features: Grey seal *Halichoerus grypus* [favourable maintained]
Secondary features: None

Conservation objectives:

For Annex I Habitats
To avoid deterioration of the qualifying habitats (listed above), thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying habitats that the following are maintained in the long term:

- Extent of the habitats on site
- Distribution of the habitats within site
- Structure and function of the habitats
- Processes supporting the habitats
- Distribution of typical species of the habitats
- Viability of typical species as components of the habitats
- No significant disturbance of typical species of the habitats

For Annex II Species
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: River Borgie SAC	
Location	Grid Ref: NC666582 (central point) Latitude 58º29'30"N Longitude 04º17'20"W
Area (ha)	32.72
Summary	This site is designated primarily for the presence of Freshwater pearl mussel *Margaritifera margaritifera* which are found throughout the main stem of the Borgie, from just above the estuary to the outflow of Loch Slaim, the lowest of a series of lochs on the river. In addition, this site, along with the Rivers Naver and Thurso is representative of the most northerly extent of the *Salmo salar* population.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
N/A

Annex II Species
Primary features: Freshwater pearl mussel *Margaritifera margaritifera* [unfavourable declining]
Secondary features: Atlantic salmon *Salmo salar* [unfavourable recovering]
Otter *Lutra lutra* [favourable maintained]

Conservation objectives:

For Annex II Species
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types for salmon, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species
- Distribution and viability of freshwater pearl mussel host species
- Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species

Site Name: River Naver SAC	
Location	Grid Ref: ND629375 (central point) Latitude 58º18'25"N Longitude 04º20'30"W
Area (ha)	1066.66
Summary	The River Naver and its major tributary, the Mallart, flow from a large peatland catchment northwards to its mouth on the north coast of Scotland. The site supports a high-quality salmon *Salmo salar* population and, along with the Rivers Borgie and Thurso, is representative of the northerly part of the species' range in the UK. With the River Borgie, this site in Sutherland represents the northern extreme for freshwater pearl mussel *Margaritifera margaritifera* in the UK.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
N/A

Annex II Species
Primary features: Freshwater pearl mussel *Margaritifera margaritifera* [unfavourable no change]
Secondary features: Atlantic salmon *Salmo salar* [unfavourable recovering]

Conservation objectives:

For Annex II Species
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types for salmon, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species
- Distribution and viability of freshwater pearl mussel host species
- Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species

Site Name: River Thurso SAC	
Location	Grid Ref: ND142490 (central point) Latitude 58º25'20"N Longitude 03º28'00"W
Area (ha)	355.58
Summary	The River Thurso drains a moderately large peatland catchment in Caithness and flows north through a short section of agricultural land before entering the Pentland Firth at the town of Thurso. The river supports a higher proportion of multi sea-winter salmon *Salmo salar* than is found in many rivers further south in its range; aided by its northerly location and the cooler ambient water temperature, resulting in slower-growing juveniles which smolt at an older age, and tend to return as older multi sea-winter salmon. In addition, grilse also return to the River Thurso, meaning that the river supports the full range of salmon life-history types.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
N/A

Annex II Species
Primary features: Atlantic salmon *Salmo salar* [unfavourable recovering]
Secondary features: None

Conservation objectives:

For Annex II Species
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Site Name: Berriedale and Langwell Waters SAC	
Location	Grid Ref: ND107238 (central point) Latitude 58º11'40"N Longitude 03º31'10"W
Area (ha)	57.62
Summary	The Berriedale and Langwell Waters on the north-east coast of Scotland support small, but high-quality salmon *Salmo salar* populations. The rivers have separate catchments, but share a short length of river just before they meet the sea. Both rivers are oligotrophic, showing only limited ecological variation along their length. Although they are small rivers and support only a small proportion of the Scottish salmon resource; their history of low management intervention means that they are significantly regarded for naturalness. Recent records indicate that the full range of Atlantic salmon life-history types return to the river, with grilse, spring and summer salmon all being caught.

Qualifying features for which the site is designated [condition]:

Annex I Habitat
N/A

Annex II Species
Primary features: Atlantic salmon *Salmo salar* [unfavourable recovering]
Secondary features: None

Conservation objectives:

For Annex II Species
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types for salmon, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2AW
www.gov.uk/decc

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