DEPARTMENT OF ENERGY & CLIMATE CHANGE

Offshore Oil & Gas Licensing

26th Seaward Round

Outer Moray Firth

Blocks 12/14, 12/16b, 12/17b, 12/18, 12/19a, 12/21b, 12/26b, 12/27, 12/30, 13/26a, 13/27c, 19/01 and 19/04

Appropriate Assessment

URN 11D/906: November 2011

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1 Introduction

1.1 Background and purpose

On 27th January 2010, the Secretary of State for the Department of Energy and Climate Change (DECC) invited applications for licences in the 26th Seaward Licensing Round.

To comply with obligations under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) (OPAR 2001), in summer 2010, 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 European conservation site, either individually or in combination with other plans or projects (DECC 2010).

In so doing, the amplification of the Habitats Directive test provided by the European Court of Justice in the Waddenzee case (Case C-127/02) was used, as follows:

> Any plan or project not directly connected with or necessary to the management of a site must be subject to an Appropriate Assessment 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.

An initial screening assessment (including consultation with the statutory agencies/bodies), identified 99 whole or part Blocks as requiring further assessment prior to decisions on whether to grant licences. 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
- Fair Isle Channel
- Northern Ireland
- Eastern Irish Sea
- Central English Channel

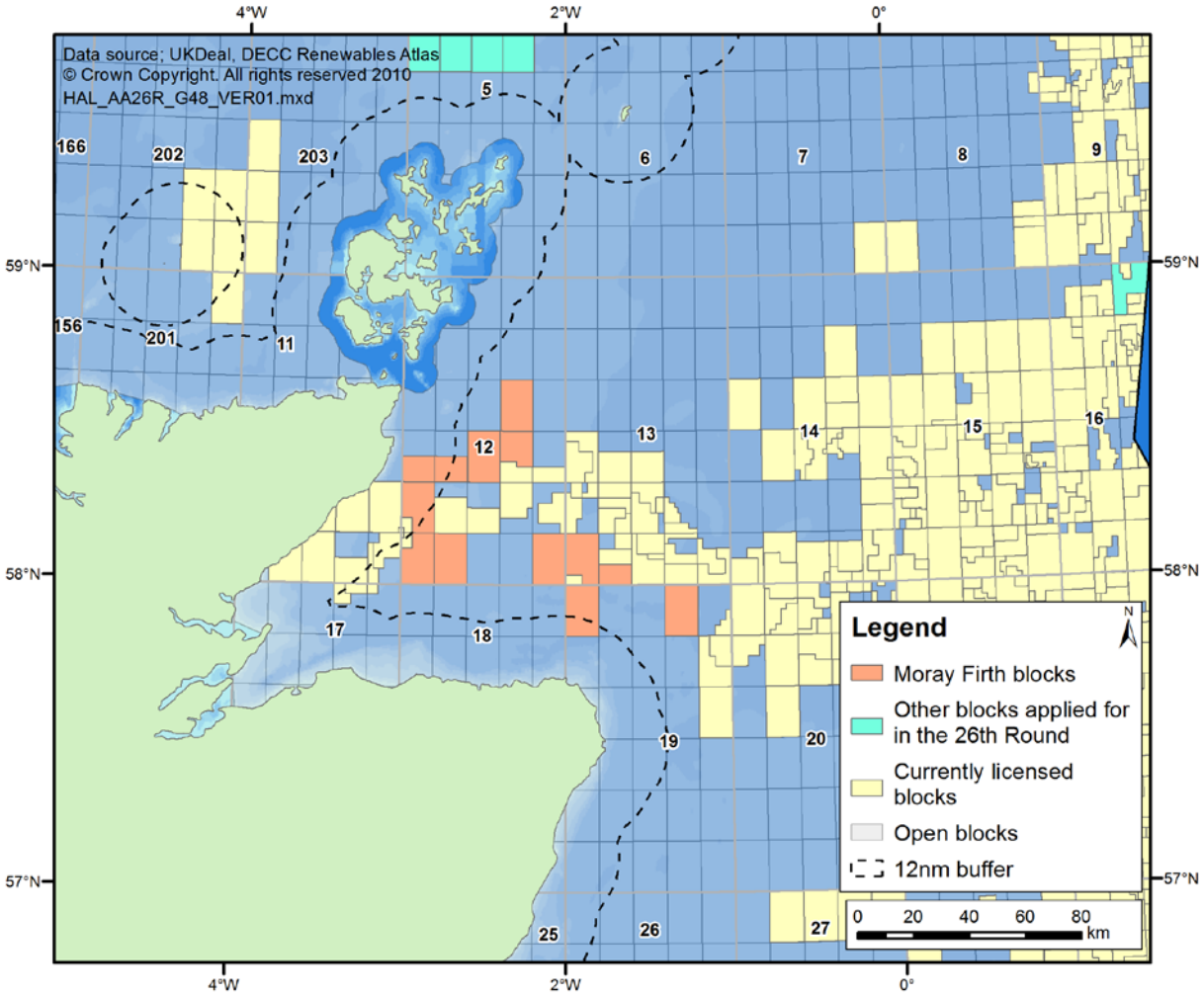
This report documents the further assessment in relation to 13 Blocks in the Outer Moray Firth (see Section 1.2).

1.2 Outer Moray Firth Blocks

The Outer Moray Firth Blocks applied for in the 26th Round considered in this document are listed below and shown in dark orange in Figure 1.1.

12/14	12/16b	12/17b	12/18	12/19a
12/21b	12/26b	12/27	12/30	13/26a
13/27c	19/01	19/04		

Figure 1.1: Location of Outer Moray Firth Blocks



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. A Licence does not confer any exemption from other legal/regulatory/fiscal requirements.

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).

- 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 Blocks(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. Field activities, such as seismic survey or drilling, are subject to further individual controls by DECC, 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 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. For 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.

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 comprising individual licences and estimates of work commitments for the Blocks derived by DECC from the range of applications received are as follows:

- 12/14 & 12/19a (linked 12/20a) – Drill or drop well
- 12/18 - Drill or drop well
- 12/16b & 12/17b – Drill or drop well and shoot 250km 2D seismic with tie lines to nearby wells
- 12/21b – Drill or drop well

- 12/30 - Drill or drop well
- 19/01, 13/26a & 13/27c – 1 or 2 Firm wells
- 19/4 (with 19/5b) – Drill or drop well and shoot 242 sq km 3D seismic

On past experience, less activity actually takes place than is bid at the licence application stage. A proportion of Blocks awarded may be relinquished without any field activities occurring. 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 stand alone developments.

The extent and timescale of development, if any, which may ultimately result from the licensing of these Blocks is therefore uncertain and would be subject to further, project level assessment (incorporating Habitats Regulations Assessment (HRA) where appropriate) prior to any consent being issued.

DECC has issued guidance on Block specific issues and concerns and these concerns will affect DECC's decision whether or not to approve particular activities. The guidance indicates seasonal concerns for the majority of the Blocks considered in this assessment (see Table 2.1 and Section 7.1).

Table 2.1: Seasonal and other concerns related to Blocks considered in this Appropriate Assessment

Block	Period of concern for seismic surveys	Period of concern for drilling	Spawning sites*	Special Conditions†
12/14	January-June August-September November-December (MS)	-	✓	-
12/16b	January –February August-September November –December (MS)	-	✓	✓
12/17b, 12/18, 12/19a, 19/01	January-June August-September November-December (MS)	-	✓	✓
12/21b	January-March August-September November-December (MS)	-	✓	✓
12/26b	January- March November-December (MS)	-	-	✓
12/27, 12/30, 13/26a	January-June (MS)	-	-	✓
13/27c	February-June (MS)	-	-	-
19/04	November-June, August-September (MS)	July-December (JNCC)	✓	-

*Note: * seabed surveys should be undertaken before any drilling activity to confirm whether there are any herring spawning sites within a three-nautical mile radius of the proposed drilling location, † Activity is of concern to the MoD because the Block lies within training ranges. For further information see: Other regulatory issues (DECC 26th Seaward licensing Round website).*

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 13 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 potential sites for which there is adequate information on which to base an assessment.

The sites considered are listed and mapped in Appendix A, and Appendix B presents the results of a screening exercise of these sites to identify the potential effects of activities that could follow the licensing of the 13 Blocks in question. In accordance with Government policy (as set out in Planning Policy Statement 9 (ODPM 2005a[1])) and revised guidance updating Scottish office Circular No. 6/1995 (Scottish Government 2000), the relevant sites considered include classified and potential SPAs, designated and candidate SACs and Sites of Community Importance[2] (SCIs). Guidance in relation to sites which have not yet been submitted to the European Commission is given by Circular 06/2005 (ODPM 2005b) which states that: "*Prior to its submission to the European Commission as a cSAC, a proposed SAC (pSAC) is subject to wide consultation. At that stage it is not a European site and the Habitats Regulations do not apply as a matter of law or as a matter of policy. Nevertheless, planning authorities should take note of this potential designation in their consideration of any planning applications that may affect the site.*" This can be augmented by the amended Scottish Government Circular 6/1995, "*...potential SPAs and potential SACs should be treated in the same way as classified SPAs...*" (i.e. that pSACs attract the same legal protection as designated sites).

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 the Tay (including the Moray Firth SAC), and Orkney 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 the Tay and Orkney and Fair Isle.
- Riverine SACs within the area for migratory fish and/or the freshwater pearl mussel.

There are no offshore Natura 2000 sites (i.e. sites located in the UK's offshore marine area[3]) which it is considered are relevant with respect to the identification of potential effects from licensing or activity in the outer Moray Firth Blocks under consideration. The closest

[1] Which states that "Listed Ramsar sites, also as a matter of policy, should receive the same protection as designated SPAs and SACs". UK coastal Ramsar sites are typically coincident with SACs and/or SPAs.

[2] 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.

[3] 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 the 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).

offshore SAC, the Scanner pockmark, lies over 130km to the east (from the nearest Block 19/04).

Information gathering is in progress to inform the potential designation of further Natura 2000 sites, for instance the work of Kober *et al.* (2010). 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.4). This information is summarised in Figures 3.1-3.2 and Tables 3.1-3.3, below.

Figure 3.1: SPAs Relevant to this Appropriate Assessment

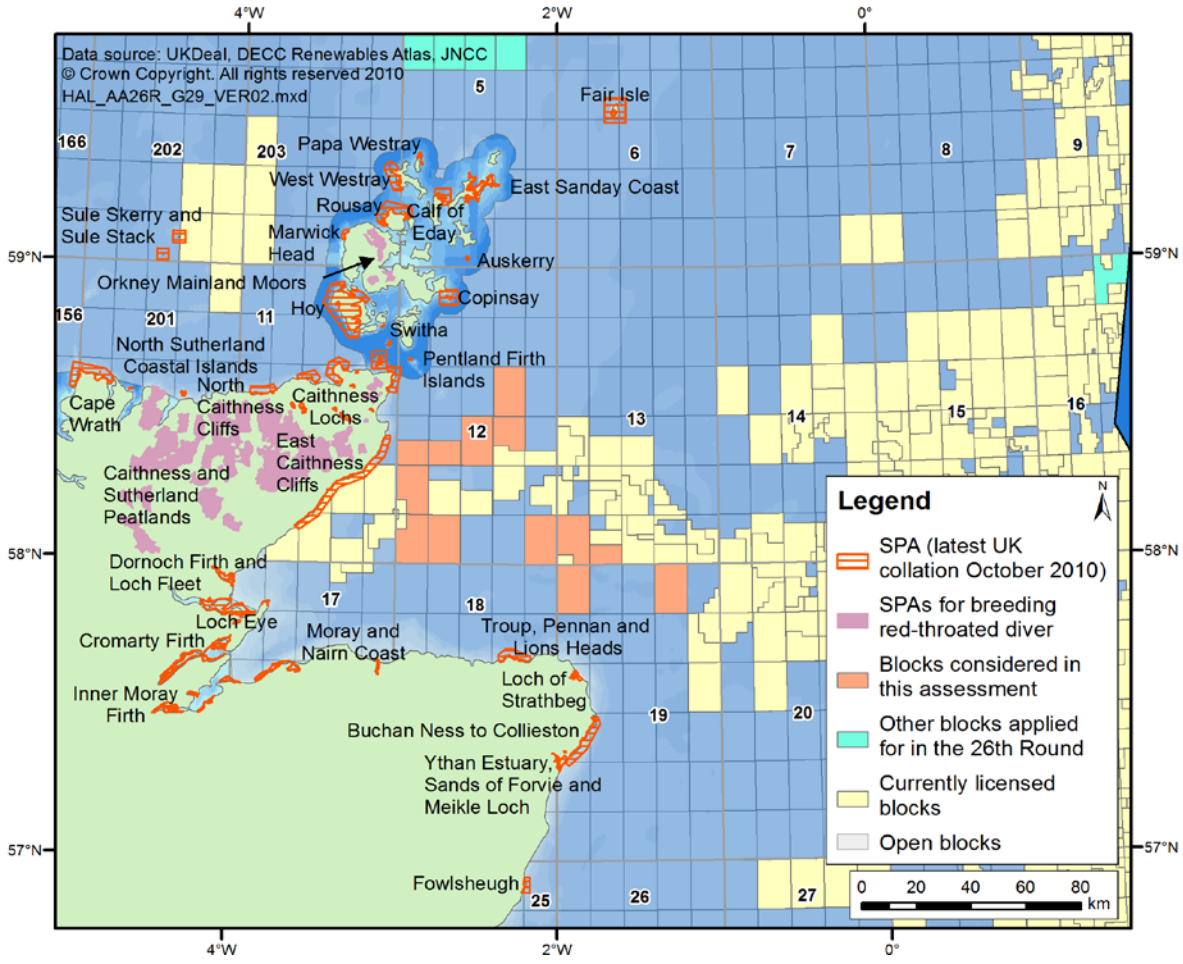


Figure 3.2: SACs Relevant to this Appropriate Assessment

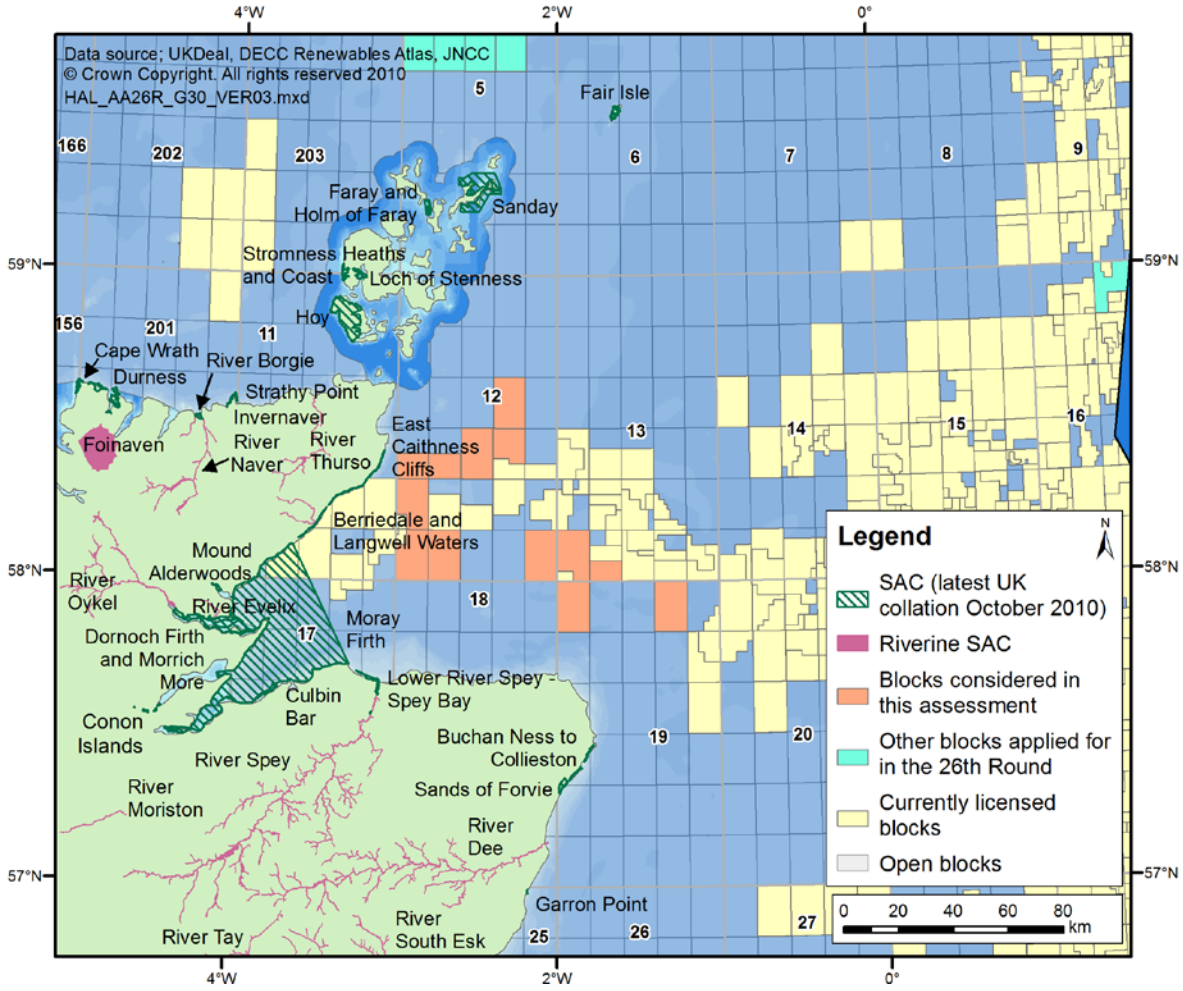


Table 3.1: SPA sites and qualifying features under Article 4.1 and 4.2, relevant to this Appropriate Assessment

	Fair Isle	Pentland Firth Islands	Switha	Orkney Mainland Moors	Hoy	Marwick Head	Rousay	West Westray	Papa Westray (North Hill & Holm)	Calf of Eday	East Sanday Coast	Auskerry	Copinsay	Sule Skerry & Sule Stack	Cape Wrath	North Sutherland Coastal Islands	North Caithness Cliffs	Caithness Lochs	Caithness and Sutherland Peatlands	East Caithness Cliffs	Dornoch Firth and Loch Fleet	Cromarty Firth	Inner Moray Firth	Loch Eye	Moray and Nairn Coast	Troup, Pennan and Lion's Head	Loch of Strathbeg	Buchan Ness to Collieston Coast	Ythan Estuary, Sands of Forvie	Fowlsheugh
Arctic tern	B	B					B	B	B			B																		
Fair Isle wren	B																													
Guillemot	B					B		B		B							B			B						B				B
Hen harrier				B,W															B											
Red-throated diver				B	B																									
Short-eared owl				B															B											
Peregrine					B												B			B										
Great skua					B																									
Gannet														B																
Puffin														B																
Arctic skua									B																					
Bar-tailed godwit											W										W	W	W		W					
Purple sandpiper											W																			
Turnstone											W																			
Leach's storm petrel														B																
Storm petrel												B		B																
Black-throated diver																			B											
Golden eagle																			B											
Golden plover																			B											
Merlin																			B											
Red-throated diver																			B											
Wood sandpiper																			B											
Common scoter																			B											
Dunlin																			B											
Greenshank																			B											
Wigeon																			B		W									
Herring Gull																				B										
Kittiwake																				B										B
Razorbill																				B										

	Fair Isle	Pentland Firth Islands	Switha	Orkney Mainland Moors	Hoy	Marwick Head	Rousay	West Westray	Papa Westray (North Hill & Holm)	Calf of Eday	East Sanday Coast	Auskerry	Copinsay	Sule Skerry & Sule Stack	Cape Wrath	North Sutherland Coastal Islands	North Caithness Cliffs	Caithness Lochs	Caithness and Sutherland Peatlands	East Caithness Cliffs	Dornoch Firth and Loch Fleet	Cromarty Firth	Inner Moray Firth	Loch Eye	Moray and Nairn Coast	Troup, Pennan and Lion's Head	Loch of Strathbeg	Buchan Ness to Collieston Coast	Ythan Estuary, Sands of Forvie	Fowlsheugh
Shag																				B										
Osprey																					B	B	B		B					
Greylag Goose																		W			W	W	W	W	W		W			
Common Tern																						B	B						B	
Whopper swan																		W				W		W			W			
Red-breasted merganser																							W							
Redshank																							W		W					
Scaup																							W							
Pink-footed goose																									W		W		W	W
Sandwich tern																											B		B	
Little tern																													B	
Greenland white-fronted goose																		W												
Barnacle goose			W													W											W			
Assemblage	B				B	B	B	B		B			B	B	B		B			B	W	W	W		W	B	W	B		B

Note: B = Breeding, W = Over Wintering, see Appendix C for more details.

Table 3.2: SAC sites and qualifying features under Annex 1 and Annex 2, relevant to this Appropriate Assessment

Annex 1 Habitats	Fair Isle	Hoy	Loch of Stenness	Stromness Heaths	Faray and Holm of Faray	Sanday	Cape Wrath	Foinaven	Durness	Invernaver	Strathy Point	East Caithness Cliffs	Mound Alderwoods	Moray Firth	Dornoch Firth and Morrich More	Conon Islands	Culbin Bar	Lower River Spey – Spey Bay	Buchan Ness to Collieston	Sands of Forvie	Garron Point	River Borgie	River Naver	River Thurso	Berriedale and Langwell Waters
Sea cliffs	P	P		P			P				P	P							P						
Heaths	Q	P,Q		P				P	Q	P															
Bog		P						Q																	
Standing freshwater		P						P	P																
Fens		Q		Q					Q	Q															
Rocky Slopes		Q						P,Q																	
Coastal lagoons			P			P																			
Reefs						Q									Q										
Sandbanks						Q								Q	Q										
Mudflats and sandflats						Q									P										
Grasslands								P,Q	P,Q	P															
Scree								P																	
Coastal dunes									P,Q	P,Q					P		Q			P					
Limestone pavements									P																
Forests													P			P		P							
Estuaries															P										
Saltmarsh and saltmeadow															P										
Salt meadows															P		Q								
Vegetation of stony banks																	P	P							

Annex 2 Species	Fair Isle	Hoy	Loch of Stenness	Stromness Heaths	Faray and Holm of Faray	Sanday	Cape Wrath	Foinaven	Durness	Invernaver	Strathy Point	East Caithness Cliffs	Mound Alderwoods	Moray Firth	Dornoch Firth and Morrich More	Conon Islands	Culbin Bar	Lower River Spey – Spey Bay	Buchan Ness to Collieston	Sands of Forvie	Garron Point	River Borgie	River Naver	River Thurso	Berriedale and Langwell Waters
Grey seal					P																				
Harbour seal						P									P										
Freshwater pearl mussel								Q														P	P		
Otter								Q	Q						P							Q			
Bottlenose dolphin														P											
Narrow mouthed whorl snail																					P				
Atlantic salmon																						Q	P	P	P

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 (AppendixA2).

Table 3.3: Species of Riverine SACs designated for migratory fish and/or the freshwater pearl mussel relevant to this Appropriate Assessment

	River Borgie	River Naver	River Thurso	Langwell and Berriedale Waters	River Oykel	River Moriston	River Spey	River Dee	River South Esk	River Tay
Freshwater pearl mussel	P	P			P	P	P	P	P	
Otter	Q						P	P		Q
Atlantic salmon	Q	P	P	P	Q	Q	P	P	P	P
Sea lamprey							P			Q
River lamprey										Q
Brook lamprey										Q

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 OPAR 2001 (as amended), DECC has:

- Considered, on the basis of the precautionary principle, whether it could be concluded that the integrity of relevant European 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), namely 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.

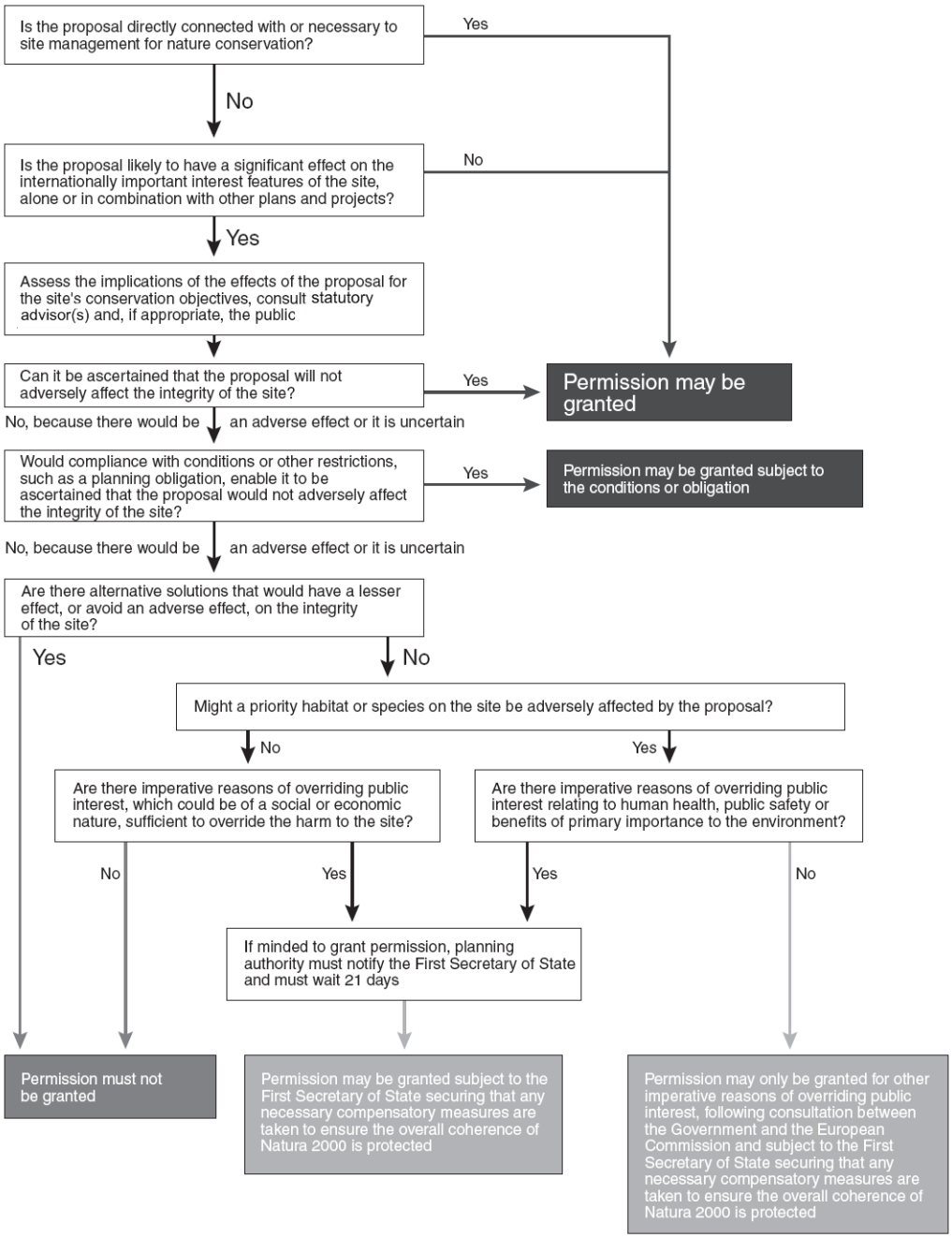
A flowchart summarising the process is shown in Figure 4.1.

4.2 Site integrity

Site integrity is defined by the ODPM Circular 06/2005 to accompany PPS9 (ODPM 2005b) as follows: "The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified." 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 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 adversely affects the integrity of the site, in the light of its conservation objectives. For sites where the potential for adverse affects has been identified, their conservation objectives are listed in a site-by-site consideration in Appendix C.

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 (2005b).

4.3 Assessment

The approach to ascertaining the absence or otherwise of adverse effects on the integrity of a European 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 Planning and Policy Statement note 9 (ODPM 2005a & b), the English Nature Research Reports, No 704 (Hoskin & Tyldesley 2006) and the Scottish Natural Heritage Habitats Regulations Appraisal of Plans, No 1739 (Tyldesley & Associates 2010).

Appendix A lists and summarises the relevant European Sites as defined in Section 3. Appendix B presents the results of a screening exercise of these sites to identify the potential for likely significant effects of activities that could follow the licensing of the 13 Blocks in question. Where potential effects are identified, more detailed information on the relevant sites is provided in Appendix C.

Detailed assessments are made in Sections 5-8 of the implications for the integrity of the relevant European Sites and their qualifying features and species, were licences for the thirteen outer Moray Firth Blocks to be granted. The assessment is based on an indication of the potential work programme for the blocks and likely hydrocarbon resources if present, along with the characteristics of the relevant sites as described in the Appendices. As noted in Section 2.2, the potential 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 European Sites are discussed under the following broad headings:

- Oil spills (including all liquid phase hydrocarbons)
- Physical disturbance and other effects (e.g. pipeline trenching, marine discharges)
- Underwater noise (in particular, seismic surveys)
- 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 (now Regulation 35 of the 2010 Regulations) 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 Environmental Impact Assessment (EIA) and permitting processes they are mitigated by timing, siting or technology requirements (or a combination of one or more of these). There is a requirement that these options would be evaluated in the environmental assessments required as part of activity consenting.

The conservation objectives identified for SAC and SPA features for sites where the potential for effects have been identified are listed in Appendix C and referred to where relevant throughout the document. These objectives, in relation to the specific qualifying features of each site, and the conservation status of these features, have been considered during this Appropriate Assessment. The basis and primary concern of the conservation objectives are to maintain or achieve favourable conservation status. Table 4.1 provides 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

A set of high level mitigation measures have been identified with regards to each of the broad sources of effect listed above (see Table 4.2). 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 that no effect can arise from 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 the relevant section (5-8) where this is the case (also see 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 several kilometres offshore and remote from Natura 2000 sites. While new pipelines could conceivably come ashore at existing terminals, either through or near to coastal SACs and SPAs, there are well proven methods to prevent significant impacts – such mitigation would be defined at the project level, and be subject to project specific EIA and HRA. Potential disturbance of certain species (e.g. in relation to herring spawning) may be avoided by seabed survey prior to the commencement of drilling operations. Blocks for which herring spawning is a potential concern have been highlighted (See Section 2.2), and licensees should expect the occurrence of such a sensitivity to affect DECC's decision whether or not to approve particular activities.

High level Mitigation	
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, AAs (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 controlling well test and routine flaring during production and by avoiding or limiting activities during months when large numbers of birds aggregate in the area.
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 *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*. DECC will expect that passive acoustic monitoring (PAM) will be routinely used as a mitigation tool. 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 DECC's 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, MMO, and relevant SNCB. 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 through permitting/HRA of specific activities (including conditions attached to consents/permits or potentially consent/permit refusal).

High level Mitigation	
	MCA is responsible for a National Contingency Plan and maintains aerial spraying and surveillance aircraft based at Coventry and Inverness and counter-pollution equipment (booms, adsorbents etc.). The MCA presently has four Emergency Towing Vessels stationed around the UK which remain on standby at sea[4].
In-combination effects	The competent authorities will assess the potential for in-combination effects during Habitats Regulations Assessments 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.

[4] The future of these vessels is presently subject to debate as a new funding stream is required for their maintenance, with the present contract to be terminated in 2011. The role of these vessels may be filled by a commercial alternative (see: http://www.parliament.uk/business/committees/committees-a-z/commons-select/transport-committee/inquiries/coastguard/).

5 Consideration of potential effects from oil spills on relevant sites

5.1 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 however, not credible to conclude that in spite of the regulatory controls and other preventative measures, an oil spill will never occur as a result of 26th Round licensing.

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. UK regulators have been in contact with 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 are implications for safety at offshore operations on the UK continental shelf.

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 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 inspectors in its Aberdeen office. This will allow the Department to carry out double inspections (i.e. inspections carried out by 2 inspectors) for more complex

drilling operations and it will also allow annual inspections of all mobile and fixed oil and gas installations, once all of the new inspectors are recruited and have completed relevant training.

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. 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.
4. 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. DECC participated in this group. 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.

As a result of the Deepwater Horizon incident a UK Parliamentary Select Committee Inquiry into the safety and environmental regulations and spill prevention and response provisions of oil and gas operations on the UKCS was held which reported in January 2011 (Energy and Climate Change Committee 2011). The report includes a series of recommendations regarding regulatory oversight, spill prevention, response and understanding. However, the Committee report did not conclude that a moratorium on drilling, even in deep water, was justified in the UK.

In January 2011 the US Government National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling released an extensive report (National Commission 2011) into the disaster, citing systematic management failures by the main companies involved and shortcomings in the US government regulatory regime as the principal sources of blame. A series of general recommendations are included in the report regarding spill prevention, response and understanding.

DECC (along with other parts of government) have considered the implications of these various findings and implemented a series of actions in response. With regards to the Moray Firth, DECC indicated in its letter to operators (dated 21st July 2011) that additional assurances will normally be required prior to the approval of drilling activities that include oil exploration, appraisal or development wells in (amongst other areas) the Moray Firth.

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 26th 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*).

Direct mortality of seabirds in the event of oil spill is highly relevant in the context of coastal breeding sites classified as SPAs (and possible SPA extensions). Waterbird vulnerability to

surface pollution has been quantified for each month on a block-by-block basis by JNCC in terms of the Offshore Vulnerability Index (OVI) (see Table 5.1), and seasonal concerns in relation to drilling have been identified for a number of Blocks considered in this AA (see Table 2.1) for which there would be a presumption against such activity taking place.

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 European Sites by activities resulting from the proposed licensing of the 13 Blocks in the 26th 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.

5.2 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.

5.2.1 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 Book" series, now superseded by on-line data available from the DECC website[5] (Figure 5.1). Discharges, spills and emissions data from offshore installations are also reported by OSPAR (e.g. OSPAR 2009).

DECC data indicate 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.

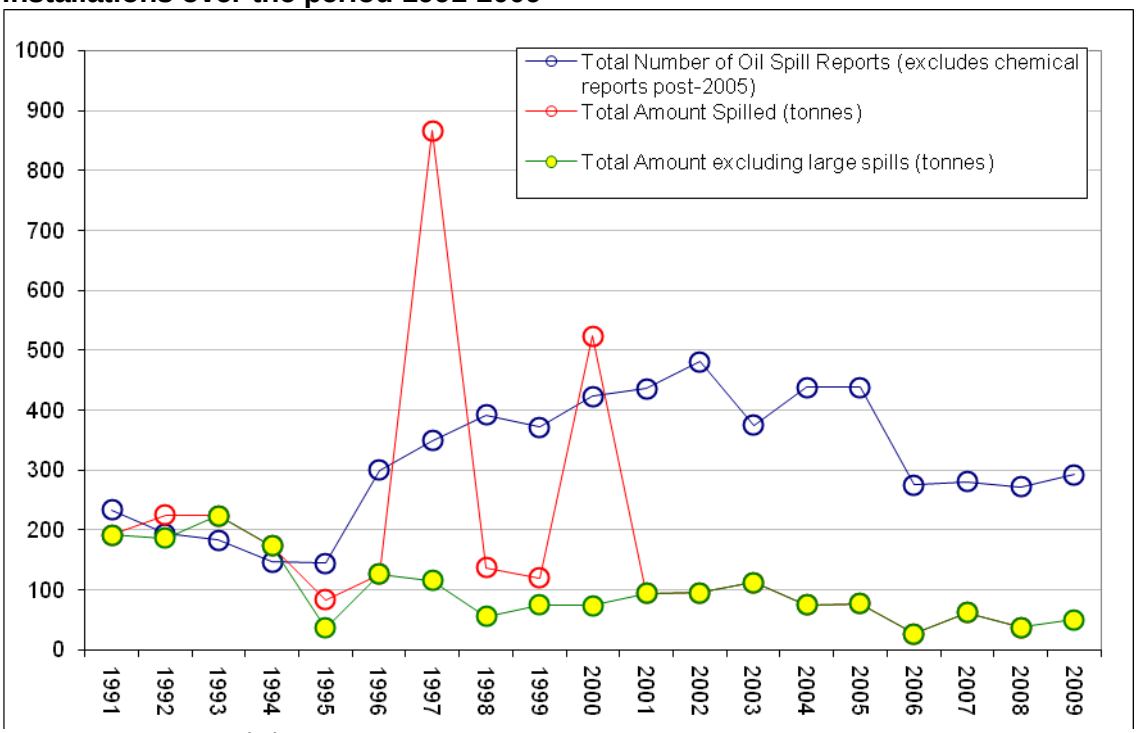
Well control incidents (i.e. "blowouts" involving uncontrolled flow of fluids from a wellbore or wellhead) have been too infrequent on the UKCS for a meaningful analysis of frequency based on historic UKCS data. A review of blowout frequencies cited in UKCS Environmental Statements as part of the OESEA2 gives occurrence values in the range 1/1,000-10,000 well-years.

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. ACOPS 2008 as reported in Dixon 2009). This includes all spills reported by POLREP reports by the MCA and PON1 reports to DECC. The number of accidental discharges attributed to oil and gas installations during 2008 showed a reduction of 6.5% over the previous year's total. Of these discharges, 65% were fuel, lubrication or hydraulic oils, with 29% of crude oil; additionally, of the discharges with volume information, 95% were less than 455 litres.

[5] Oil and chemical discharge notifications (accessed October 2010) https://www.og.decc.gov.uk/information/bb_updates/chapters/Table_chart3_1.htm

Since the mid-1990s, the reported number of spills has increased, consistent with more rigorous reporting of very minor incidents (e.g. the smallest reported spill in 2003 was 0.0001 litres). 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 2009 totalled 2,900 tonnes (DECC website[6]).

Figure 5.1: Number and volume of reported oil spills from UKCS oil and gas installations over the period 1991-2009



Source: DECC website

Since the mid-1990s, the reported number of spills has increased, consistent with more rigorous reporting of very minor incidents (e.g. the smallest reported spill in 2003 was 0.0001 litres). 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 2009 totalled 2,900 tonnes (DECC website).

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, 2010).

5.2.2 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 types in the outer Moray Firth Blocks are primarily oil but condensate or gas may also be found. Therefore the potential risk of crude oil spills has

[6] Oil discharged with produced water 2005 – 2009
https://www.og.decc.gov.uk/information/bb_updates/chapters/Table3_2.htm

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.

Coincident with these weathering processes, surface and dispersed oil will be transported as a result of tidal (and other) currents, wind and wave action. Generally, the 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 outer Moray Firth Blocks would push spilled oil towards Orkney and out into the central and northern North Sea. 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 and rig availability, time to drill the well etc.). Representative modelling cases from various parts of the UKCS have been reviewed by successive SEAs.

5.2.3 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. Chronic pollution resulting from illegal dumping or tank washing probably has a greater chronic impact on seabirds than accidental spills from shipping casualties.

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 5.1, below) are determined by combining the density of each species of bird present with its vulnerability index score. Of the species commonly present offshore in UK offshore waters, gannet, skuas and auk species (e.g. SPA sites include Fair Isle, Calf of Eday, Hoy, North Caithness Cliffs and East Caithness Cliffs) 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, vulnerability in inshore waters can also be very high in some areas.

Table 5.1: Monthly seabird vulnerability to surface pollution in relevant 26th Round Blocks

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
12/14	2	2	1	1	1	1	1	1	2	3	2	4	1
12/16	1	1	1	1	1	1	1	1	1	1	1	2	1
12/17	1	1	1	1	1	1	1	1	1	1	1	2	1
12/18	1	1	1	1	1	1	1	1	1	1	1	2	1
12/19	2	2	1	1	1	1	1	1	1	2	2	3	1
12/21	1	1	1	1	1	1	1	1	1	1	1	1	1
12/26	1	1	1	1	1	1	1	1	1	1	1	1	1
12/27	1	1	1	1	1	1	1	1	1	1	1	1	1
12/30	2	2	1	1	1	1	1	1	1	1	1	1	1
13/26	3	3	2	2	1	2	1	1	1	3	2	2	2
13/27	3	3	2	2	1	2	1	1	1	3	2	2	2
19/1	2	2	2	1	1	1	1	1	1	3	1	1	1
19/4	3	2	2	2	3	2	1	1	1	2	2	3	2

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

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. Surveys carried out in early spring of 2008 (Cork Ecology 2008) recorded the presence of various waterbirds (black throated diver, goldeneye, great northern diver, eider, long tailed duck) and seabirds (fulmar, gannet, cormorant, shag, black headed gull, common gull, lesser black-backed gull, herring gull, greater black-backed gull, kittiwake, guillemot, razorbill, black guillemot, little auk and puffin) within the Moray Firth.

Oil spill risks to marine mammals have been reviewed by successive SEAs 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. 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.

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).

Those coastal and marine Annex I habitats which are most sensitive to oil spills are identified in Table 5.2, below. Generally, sheltered habitats of lower exposure to wave energy are considered most vulnerable; oil may persist for long periods in such environments.

5.3 Implications for relevant European Sites

Relevant sites have been screened in Appendix B and 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 European 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 an unlikely 30 knot onshore wind, over a release time of 10 days.

5.3.1 Special Areas of Conservation

The ecological sensitivity of the qualifying features of relevant sites to oil spills varies. 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 and sandbanks** – 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, such that conservation objectives would be undermined.
- **Lagoons, dunes** – sites above Mean High Water Springs not generally vulnerable to surface oil pollution, except possibly to wind-blown oil or evaporated hydrocarbons. Lagoons typically have periodic connections to the sea; such connections can be protected from the ingress of surface pollutants.
- **Sea cliffs, sea caves** – generally not considered sensitive due to wave reflection and rapid recovery (e.g. Gundlach & Hayes 1978) – 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. Includes: narrow-mouthed whorl snail (*Vertigo angustior*), freshwater pearl mussel (*Margaritifera margaritifera*), and non-coastal otter populations (*Lutra lutra*). 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 5.2 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. Due to the relatively close proximity to each other of the outer Moray Firth Blocks under consideration, site vulnerability is considered relevant for all thirteen Blocks. Note: several sites are represented in more than one risk category.

Table 5.2: Annex I habitat types and Annex II species potentially vulnerable to oil spills

Mudflats and sandflats
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:** Sanday SAC, Dornoch Firth and Morrich More 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:** Dornoch Firth and Morrich More SAC
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. **Sites potentially at risk:** Culbin Bar SAC, Dornoch Firth and Morrich More SAC
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:** None
Bottlenose dolphin
Sites comprise a variety of marine habitats utilised by bottlenose dolphins (*Tursiops truncatus*) for foraging and other activities, with extensive areas beyond the site boundary also utilised. Vulnerable to oil spills due to their dependence on the sea surface for breathing. **Sites potentially at risk:** Moray Firth SAC
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). **Sites potentially at risk:** Faray and Holm of Faray SAC, Sanday SAC, Dornoch Firth and Morrich More SAC
Coastal otters
Sites contain shallow, inshore coastal areas utilised by important populations of otter (*Lutra lutra*) for feeding. **Sites potentially at risk:** Dornoch Firth and Morrich More SAC

Atlantic salmon
Though not generally vulnerable to surface oil pollution due to the absence or paucity of time spent at the water's surface, available evidence suggests that 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) noted dive depths of between 85 and 280m (Malcolm *et al.* 2010). 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. **Sites potentially at risk:** River Borgie, River Naver, River Thurso, Berriedale and Langwell Waters, River Oykel, River Moriston, River Spey, River Dee, River South Esk, River Tay.

The following SACs, listed in Table 5.2, have relevant non-statutory advice from SNH on their sensitivity and vulnerability to oil spills.

5.3.1.1 Moray Firth SAC

(Annex II qualifying species: Bottlenose dolphin *Tursiops truncatus*)

Relevant non-statutory SNH advice[7]

- Oil exploration has the potential to cause disturbance or deterioration of dolphin populations or their prey through oil-related development and activities, especially those that may result in seismic activities, the accidental discharge of oil, increased vessel movements, de-fouling of rigs and de-commissioning of installations and infrastructure.
- Local authority emergency plans and oil pollution emergency plans should take into account specific qualifying interests and recognise the importance of marine SACs should such incidents occur.
- Accidental or deliberate discharge of oil by any type of operation has the potential to cause deterioration of sandbanks through toxic contamination of seabed communities, or the smothering of the seabed.

Consideration

The distribution and size of the bottlenose dolphin population of the Moray Firth has been the subject of a number of surveys with ongoing studies assessing the potential impacts of oil and gas exploration (primarily related to seismic survey) on cetacean populations in the area (see Thompson *et al.* 2010, 2011a). As described in the Moray Firth SAC consideration in Section 7.3, almost all bottlenose dolphin sightings and passive acoustic detections are within 15km of the coast in the inner part of the Moray Firth SAC or the coastal strip along the southern Moray Firth.

The Annex I habitat 'Sandbanks which are slightly covered by seawater at all times', consist of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20m below chart datum (but sometimes including channels or other areas greater than 20m deep) (JNCC website). Within the Moray Firth SAC, the Annex I habitat is restricted to more inshore areas rather than areas of the SAC which are in proximity to any of the Blocks on offer.

Subtidal sandbanks are often high-energy mobile environments which often support fish spawning grounds and nursery areas for juvenile fish. This productivity in turn becomes an important food source for marine mammals and seabirds. The conservation importance of

[7] SNH (2006). Moray Firth Special Area of Conservation Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

these habitats centres on their intrinsic value based on the biological communities present, together with the predators which are dependent on them (SNH 2006).

Subtidal sands are less at risk from oil spills than intertidal sediments unless dispersants are used in clean-up operations or if wave action allows sediment mobility and thus oil to be incorporated into the sediments (Jones *et al.* 2000). Given that chemical dispersant use is generally inappropriate in shallow sheltered waters, in water depths of less than 20m and in waters extending up to 1.15 miles (equivalent to 1 nautical mile) beyond the 20m contour (DECC 2009a), it is unlikely that dispersants would be used on an oil spill and therefore the oil would be unlikely to alter the long-term extend or distribution of the habitats, or their functioning such that the species typical of these habitats would not be maintained.

The majority of the proposed work programmes indicate a drill or drop well. Therefore, following examination of existing seismic information a decision will be made by the prospective licensee to drill a well or relinquish the block. There is only a commitment to drill 1-2 wells in Blocks 19/01, 13/26a & 13/27c. As the location and design of any proposed drill or drop/firm well is not known, a detailed assessment of the potential for effects of a particular operation cannot be made at this time.

Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment 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.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not generate effects which would result in the conservation objectives for the qualifying features of the Moray Firth SAC being undermined – i.e. that the long-term viability of the population of bottlenose dolphin, and the extent, distribution and functioning of its supporting habitat, including sandbanks which are slightly covered by sea water all the time, are maintained, and that typical species of qualifying habitats, and the bottlenose dolphin, are not subject to significant disturbance.

5.3.1.2 Dornoch Firth and Morrich More SAC

(Annex I qualifying habitats: Estuaries, mudflats and sandflats not covered by seawaters at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows, shifting dunes, fixed dunes, sandbanks which are slightly covered by sea water all the time, reefs
Annex II qualifying species: Otter *Lutra lutra*, harbour seal *Phoca vitulina*)

Relevant non-statutory SNH advice[8]

- No management advice is given in relation to oil exploration although advice on marine traffic is relevant. Oil spills have the potential to cause damage to seal haul outs and otters. Seals and otters generally leave an area in which oil is spilled but a small number of individuals may suffer from respiratory problems and die as a result of the spillage of a large amount of oil.

[8] SNH (2006). Dornoch Firth and Morrich More Special Area of Conservation Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

Consideration

The qualifying habitats for the Dornoch Firth and Morrich More SAC are all coastal features which are a considerable distance from the Blocks considered in this assessment, and are on an opposing bearing to the predominant wind direction. As with the Moray Firth SAC, the dominance of wind forcing on the hydrography of the area and the fact that large parts of the Dornoch Firth and Morrich More SAC are protected from the Moray Firth itself means that the likelihood of impact from a spill originating from any of the Blocks is low.

SNH[9] note that the harbour seal population feature of the Dornoch Firth and Morrich More SAC was unfavourable (recovering) in the first reporting cycle. In this, counts of harbour seals were undertaken during the moulting season in three separate years. Counts varied from 405 seals in 2000, 220 seals in 2002 and 290 seals in 2003, although the survey in 2002 is considered to be an undercount. The decline in the number of harbour seals within the SAC led to the development of the Moray Firth Seal Management Plan, which effectively restricts shooting and other methods of predator control to tightly defined management zones around the main salmon rivers within the Moray Firth and has been underpinned by a series of Conservation Orders under the *Conservation of Seals Act 1970*.

Two aerial surveys of the inner Moray Firth including Loch Fleet and Findhorn were completed in August 2008, and more recently a survey was undertaken in August 2009. Numbers of harbour seals hauled out varied between 582 and 478 in 2008, and 618 in 2009, and if the adjacent haulout sites in Loch Fleet and at the mouth of the Findhorn were included, the numbers increased to between 670 and 738 (2008), and 756 (2009). If it is assumed that 60% to 70% of the population was hauled out, the maximum count in 2008 would produce a total population of 1,050 to 1,230 harbour seals, or 1,080 to 1,260 in 2009 (SCOS 2009, 2010). Counts for the Dornoch Firth varied between 130 to 264 harbour seals (SCOS 2009).

Within the SAC, seals utilise sand-bars and shores at the mouth of the estuary as haul-out and breeding sites. The seals forage outside of the SAC throughout the Moray Firth, with areas of particular importance identified east and north of the Dornoch Firth (Sharples *et al*. 2005, 2008). Foraging ranges vary between individuals and there are known to be seasonal variations, with more frequent and relatively longer foraging trips away from the haul-out sites during the summer than during the winter months, when harbour seals may remain closer to the inner Moray Firth area (Thompson *et al.* 1991). Data on the distribution of tagged females during June and July show seals foraging widely within the inner Moray Firth (Parijs *et al*. 1997). The use of haul-out sites varies during the year, with peak usage from June through to August, during pupping, lactation and, in particular, during the moult. Post-moult, the usage of haul out sites decreases, with much lower numbers during the winter. Daily variations in the use of haul-out sites also occur, with greatest numbers ashore two hours of either side of low tide, and there are also decreases in usage during periods of heavy rain (Duck 2003).

In view of geographic position of the Blocks, Annex I habitat features and Annex II species of the Dornoch Firth and Morrich More SAC are considered only to be at risk from large-scale spills, the likelihood of which is extremely low (blowout occurrence frequency in the range of 1/1000-10,000 well years, see Section 5.2).

The majority of the proposed work programmes indicate a drill or drop well, with 1 or 2 form wells indicated for Blocks 19/01, 13/26a and 13/27c. In the former case, following examination of existing seismic information a decision will be made by the prospective

[9] SNH response to 24th Round Appropriate Assessment, Block 17/3, March 2008

licensee to drill a well or relinquish the block. As the location and design of any proposed drill or drop/firm well is not known, a detailed assessment of the potential for effects cannot be made at this time.

Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment 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.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities will not have an adverse affect on the site integrity which could undermine the conservation objectives of the qualifying features of the Dornoch Firth and Morrich More SAC.

5.3.2 Riverine SACs

(Annex II qualifying species: Atlantic salmon *Salmo salar*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, freshwater pearl mussel *Margaritifera margaritifera*)

Though SNH have not provided non-statutory advice for riverine sites, in response to feedback during consultation, consideration of their sensitivity to oil spills is provided below. 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 (e.g. River Borgie SAC, River Naver SAC, River Thurso SAC, Berriedale and Langwell Waters SAC) in spring and early summer as smolts, and migrate towards feeding areas in the Nordic Seas and West Greenland. Malcolm *et al.* (2010) note 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* (e.g. Foinaven SAC River Borgie SAC, River Naver SAC). 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.

The River Spey also maintains populations of sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis* (both favourable maintained). Both the river lamprey sea lamprey migrate up rivers to spawn and spend the larval stage buried in muddy substrates in freshwater. Once metamorphosis takes place, the adults migrate to the sea where they live as a parasite on various species of fish. Sea lampreys are thought to inhabit both shallow coastal and deep offshore waters, venturing further than river lampreys.

The majority of the proposed work programmes indicate a drill or drop well, with a firm proposal for a well in Blocks 19/01, 13/26a & 13/27c. Following examination of existing seismic information a decision will be made by the prospective licensee to drill a well or relinquish the block. As the location and design of a proposed drill or drop/firm well is not known, a detailed assessment of the potential for effects cannot be made at this time.

Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites and species would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal), in addition to those mitigation measures which are mandatory – 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.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities will not have an adverse affect which could undermine the conservation objectives of the qualifying features of any of the riverine SACs listed in Table 5.2.

5.3.3 Special Protection Areas

Table 5.3 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. Due to the relatively close proximity to each other of the outer Moray Firth Blocks under consideration, site vulnerability is considered relevant for all thirteen Blocks. Note: several sites are represented in more than one risk category.

Note: while Switha SPA and Caithness Lochs SPA fall under the category of *firths, lochs and estuaries supporting wintering waterfowl*, they are not considered to be vulnerable to oil spills and are not listed in Table 5.3. The qualifying geese and swan species use the sites for roosting and primarily forage in surrounding agricultural and freshwater wetland habitats; their use of adjacent marine environments is very limited.

Table 5.3: SPA types potentially vulnerable to oil spills

Cliff-breeding seabird colonies
Designated for colonial breeding seabirds (including auks, fulmar, kittiwake, cormorant, and gannet) which nest either on, or generally associated with sea cliffs. Birds extensively utilise adjacent coastal waters for a variety of activities, and also forage beyond site boundaries. **Sites potentially at risk:** Fair Isle SPA, Hoy SPA, Calf of Eday SPA, Copinsay SPA, North Caithness Cliffs SPA, East Caithness Cliffs SPA, Troup, Pennan and Lion's Heads SPA
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:** Fair Isle SPA, Pentland Firth Islands SPA, Hoy SPA, Calf of Eday SPA, Auskerry SPA, Copinsay SPA, East Caithness Cliffs SPA, Cromarty Firth SPA, Inner Moray Firth SPA, Troup, Pennan and Lion's Heads SPA, Loch of Strathbeg SPA
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:** Orkney Mainland Moors SPA, Hoy SPA, Caithness and Sutherland Peatlands 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. **Sites potentially at risk:** East Sanday Coast SPA, Moray and Nairn Coast SPA
Firths, lochs and estuaries supporting wintering waterfowl
Contain enclosed and semi-enclosed coastal and intertidal habitats (particularly wetlands) supporting a variety of wintering waterfowl and waders, often in large aggregations. Some species (e.g. seaducks) feed beyond the boundaries of sites. **Sites potentially at risk:** Dornoch Firth and Loch Fleet SPA, Cromarty Firth SPA, Inner Moray Firth SPA, Loch Eye, Loch of Strathbeg SPA

Consideration

The conservation features of the sites listed in Table 5.2 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 5.2), which could result in significant disturbance to species. Additionally, such a large spill could result in damage to supporting habitats including intertidal areas utilized by a variety of wintering waterfowl and waders.

The likelihood of a large oil spill is extremely low (blowout occurrence frequency in the range of 1/1000-10,000 well years, see Section 5.2). The majority of the proposed work programmes indicate a drill or drop well. Therefore, following examination of existing seismic information a decision will be made by the prospective licensee to drill a well or relinquish the block. As the location and design of a proposed drill or drop well is not known, a detailed assessment of the potential for effects cannot be made at this time.

Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment 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.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not have an adverse affect which could undermine the conservation objectives of the qualifying features of the SPAs within the Moray Firth. Moreover, JNCC has highlighted a period of seasonal concern (July-December) for drilling for Block 19/04 (see Table 2.1), and DECC will apply a presumption that no drilling activity takes place during this period unless agreement is reached with the body that requested the restriction, or appropriate mitigation measures can be agreed (defined at the project level).

5.4 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 Marine Management Organisation or relevant Devolved Authority, the Joint Nature Conservation Committee and the relevant inshore statutory nature conservation body, e.g. Scottish Natural Heritage, before approval by DECC. 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").

Offshore, primary responsibility for oil spill response lies with the relevant Operator, although the Secretary of State's Representative may intervene if necessary. The Maritime and Coastguard Agency is responsible for a National Contingency Plan and currently maintains four Emergency Towing Vessels stationed around the UK, which remain on standby at sea (see footnote 4 on page 20). The MCA maintains a contractual arrangement for provision of aerial spraying and surveillance, with aircraft based at Coventry and 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. DECC is a partner in undertaking regular aerial surveillance operations of offshore installations, as a deterrent measure.

For activities in proximity to sensitive shorelines, the Department's guidance (DECC 2009a) 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[10] scenario
- 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 5.1). Oil & Gas UK established the Oil

[10] 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).

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. The Group had four specialist review groups whose remit was to focus on:

- technical issues including first response for protection of personnel;
- oil spill response capability and remediation including national emergency response measures;
- indemnity and insurance requirements;
- pan-North Sea regulations and response mechanisms.

The Oil Spill Response Group (OSRG) of OSPRAG was established to review the UK's oil spill response capability and industry co-ordination with the national response mechanism. Its areas of focus were spill scenarios and modelling, review of physical response capability, sensitivity and protection mapping in relation to clean up and restoration, Oil Pollution Emergency Plans (OPEPs) and exercising OPEPs. An early action of the OSRG was to facilitate planning for an early exercise of the NCP (see above).

OSPRAG's technical review group has completed its review of the UK offshore oil and gas industry's practices in the following areas: well examination verification and primary well control, blow-out 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.

5.5 Conclusions

Individual European Sites have been categorised in terms of potential vulnerability, based on location in relation to known hydrocarbon prospectivity of the proposed licence Blocks and therefore the nature and magnitude of credible risks. Two categories of vulnerability were identified:

- Those sites considered to be at potential risk, 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/where present conservation status may be negatively affected).
- 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.

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 enables 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 activities, a risk-based assessment is appropriate.

Following licensing, specific activities require permitting (see section above) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment 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.

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 licences for Blocks 12/14, 12/16b, 12/17b, 12/18, 12/19a, 12/21b, 12/26b, 12/27, 12/30, 13/26a, 13/27c, 19/01 and 19/04 would not adversely affect the integrity of European Sites.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities will not have an adverse affect on the site integrity of Natura 2000 sites.

6 Consideration of sites and potential physical and other effects

6.1 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 European Sites assessed to be at potential risk.

6.2 Physical damage at the seabed

The main sources of physical disturbance of the seabed from oil and gas 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.

- **Production platform jacket installation**. Limited physical footprint similar to a drilling rig, but present on site for longer period. Physical disturbance associated with platform removal during decommissioning is comparable to that of installation.

- **Subsea template and manifold installation**. Limited physical footprint at seabed, smaller than a drilling rig, but present on site for longer period. Physical disturbance associated with subsea template and manifold removal during decommissioning is comparable to that of installation.

- **Pipeline, flowline and umbilical installation, trenching and potentially, placement of rock armour**. Anticipated hydrocarbons are primarily oil (with gas and condensate also possible) and given the location of the 13 Blocks applied for, it is anticipated that new field developments will be 'tied back' to existing infrastructure. Large pipes (greater than 16" diameter) do not have to be trenched according to a general industry agreement as they will not be moved by fishing gear, but they may still need to be trenched for reasons of temperature loss or upheaval buckling (due to buoyancy). Trenches may require several passes before they are of the required depth, or it may be impossible to achieve the required depth due to obstructions, in which case rock is usually placed on the pipeline (rock dump) to protect and stabilise it.

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. 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 & Lindeboom 1994, Kaiser *et al*. 2002a, Kaiser *et al*. 2002b, Gage *et al*. 2005). On the basis that seabed disturbance is qualitatively similar to the effects of severe storms, sand and gravel habitat recovery from the processes of anchor scarring, anchor mounds and cable scrape is likely to be relatively rapid (1-5 years) in most shallower and exposed (as opposed to sheltered) areas.

The broad distribution of large scale biotopes of conservation importance is relatively well understood in the region (e.g. 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 controlled by a range of statutory measures including Consent to Locate, PON15B, Environmental Statement, Pipeline Works Authorisation and, where relevant, AA. Provisions under the Marine and Coastal Access Act (2009) and Marine Scotland Act (2010) include certain activities previously covered by the Food and Environment Protection Act; guidance on these is pending. Based on the results of the assessments including AA, DECC may require additional mitigation measures to avoid or minimise any adverse effects, or where this is not possible, refuse consent.

6.3 Marine discharges

As described in previous 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).

Most studies of produced water toxicity and dispersion, in the UK and elsewhere (see E&P Forum 1994, OLF 1998, Riddle *et al*. 2001, Berry & Wells 2004) have concluded that the necessary dilution to achieve a No Effect Concentration (NEC) would be reached at <10 to 100m and usually less than 500m from the discharge point. However, under some circumstances (e.g. strong stratification: Washburn *et al.* 1999), a plume concentration sufficient to result in sub-lethal effects may persist for >1,000m (Burns *et al*. 1999).

Monitoring with caged mussels in the Netherlands and Norwegian sectors of the North Sea has shown that mussels exposed to produced water discharges may accumulate PAH and show biological responses up to 1,000m from the discharge. Concentrations of PAHs and

alkyl phenols and measured biological responses in wild fish such as cod and haddock caught in the vicinity of offshore installations from Norwegian waters in 2002 and 2005 showed a mixed pattern mostly with no increased concentrations, but some elevated biological responses suggesting past exposure. Exposure of cod sperm cells to environmentally relevant concentrations (100, 200, 500 ppm) of produced water from the Hibernia platform, Newfoundland, did not result in a strong toxicity to the cells (only subtle changes were observed) or a significant change in fertilisation rate (Hamoutene *et al.* 2010).

The OSPAR QSR (2010) noted that results from water column monitoring are complex to interpret, particularly for wild fish for which it is not possible to link observed biological responses to a specific exposure source. Monitoring data are limited and do not yet allow conclusions to be drawn on the significance of observed responses for marine life and ecosystems. However, OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations includes a presumption against the discharge to sea of produced water from new developments. Only under certain circumstances (e.g. injection pump maintenance) may the effluent be routed to sea. Any produced water discharged will be treated since it is still required to meet legal quality standards in terms of oil in water concentration (DECC 2011).

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 or reinjection of a proportion of waste material (DECC 2011).

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.

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 platform-derived discharges, a range of discharges is associated with operation of subsea infrastructure (hydraulic fluids), pipeline testing and commissioning (treated seawater), and 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 Chemical Regulations (2002) in 2011 mean that additional activities are now captured within a permit. 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. They would also be considered in detail in project-specific Environmental Statements, AAs (where necessary) and chemical risk assessments under existing permitting procedures.

6.4 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. 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 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, de-ballasting is unlikely to take place in these areas 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). Furthermore, the flaring of hydrocarbons generates a bright light which may also be visible over a considerable distance. Platform illumination and flares have been shown to have an attractive effect on many species of seabird; this attraction is enhanced by conditions of poor visibility such as fog, haze and drizzle (Wiese *et al.* 2001 and references therein). Bird mortality resulting from collisions with the structure and flare (leading to incineration) is the primary concern, although any such mortality will be several orders of magnitude lower than that of natural or other anthropogenic mortality (e.g. predation by domestic cats) and is not considered to be significant at a population-level. The lights on installations and vessels are primarily non-flashing so the strong behavioural effects noted by Bruderer *et al.* (1999) in response to a strong searchlight being switched on and off are not anticipated. Potential effects can be mitigated through the control or avoidance of well test and routine flaring during production, and timing controls can be used since drilling and construction are temporary activities. It is therefore concluded that light effects will not affect site integrity, nor undermine the

conservation objectives of sites with qualifying mobile species (e.g. birds) which could potentially interact with illuminated platforms and vessels.

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 relevant sites (e.g. Caithness and Sutherland Peatlands SPA, Inner Moray Firth SPA) because of the location of the SPAs relative to the Blocks applied for, the absence of marine SPAs designated for particularly sensitive (shy) species in the outer Moray Firth, the projected limited scale and nature of developments, 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 is further reduced. It is therefore concluded that adverse effects from physical disturbance are not expected.

6.5 Implications for relevant European Sites

The screening process (summarised in Appendix B) did not identify that the conservation objectives/status of any of the relevant sites would be undermined by the potential for physical disturbance, discharge effects or light effects in any relevant sites, largely due the distance between the blocks under consideration and Natura 2000 sites. Additionally, any potentially damaging activities that could following licensing of Blocks 12/14, 12/16b, 12/17b, 12/18, 12/19a, 12/21b, 12/26b, 12/27, 12/30, 13/26a, 13/27c, 19/01 and 19/04 would be subject to statutory risk assessment, mitigation and permitting measures, which would include assessment of the potential effects on the integrity of Natura 2000 sites.

6.6 Conclusions

All blocks under consideration in the outer Moray Firth area are at least several kilometres offshore and remote from Natura 2000 sites. Adverse effects identified 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 threaten the long-term viability of qualifying habitats and/or populations of species of the Natura 2000 sites considered in this assessment. It is unlikely that any new terminals would be built as a result of developments following 26th Round Licensing. While new pipelines could conceivably come ashore at existing terminals, either through or near to coastal SACs and SPAs, there are well proven methods to prevent significant impacts. 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 Natura 2000 sites.

Taking into account the information presented above and in the Appendices, it is concluded that with mitigation, activities arising from the licensing of Blocks 12/14, 12/16b, 12/17b, 12/18, 12/19a, 12/21b, 12/26b, 12/27, 12/30, 13/26a, 13/27c, 19/01 and 19/04 will not cause an adverse effect on the integrity of European Sites, though consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not have an adverse affect on the integrity of European Sites.

7 Consideration of sites and potential acoustic effects

7.1 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 periods of concern for seismic (see Table 2.1) and it is envisaged that consent would not be granted for seismic survey during these periods. 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 Spey and Dee) and two species of lamprey (e.g. Rivers Tay and Spey). Specific to Atlantic salmon, 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 European Sites, such as bottlenose dolphin *Tursiops truncatus* (Moray Firth SAC), harbour seal *Phoca vitulina* (Sanday SAC, Dornoch Firth and Morrich More SAC), grey seal *Halichoerus grypus* (Faray and Holm of Faray SAC) and several seabird species such as guillemot, herring gull, razorbill (e.g. East Caithness Cliffs SPA, Fowlsheugh SPA).

There are currently no UK Natura 2000 sites with mobile marine invertebrates as qualifying features. However, invertebrates such as crabs and squid may form an important component of the diet of qualifying Annex II species, for example bottlenose dolphin. 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).

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 (penguins) 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 (see Appendix C), 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 7.5) 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 E&P related noise is insignificant. In specific cases of concern, mitigation through routeing restrictions could be implemented.

7.2 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, 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. 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.

7.2.1 Seismic survey

With the exception of explosives and modern military sonar (and possibly windfarm 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.

Current levels of seismic survey in the UKCS are around 20-30 surveys per year, which has been the case for the past few years. This has declined from 75 surveys in 1997 (DECC database of PON14 closeout submissions).

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 array 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 and Fish (1998) recorded 8kHz sounds above background levels at a range of 8km from the source, even in a high noise environment.

7.2.2 Other activities

Pile-driving of foundations may generate high source levels and has been widely recognised as a potential concern, in particular for large offshore wind developments where many piles may be installed sequentially over long time scales (as reviewed in DECC 2011). Brandt *et al.* (2011) reporting on piling operations at the Horns Rev II site off the Danish west coast, indicated that during 1 pile driving event, the peak noise level reached 196 dB re 1 µPa, the sound exposure level (SEL) reached a maximum of 176 dB re 1 μPa^2 s and the M-weighted SEL (see below) reached 170 dB re 1 μPa^2 s at 720m distance. At a distance of 2,300m, peak levels reached 184 dB re 1 µPa, SEL 164 dB re 1 μPa^2 s and M-weighted SEL reached 157 dB re 1 μPa^2 s. Pile-driving also occurs in connection with oil and gas facilities, although the pile diameters are smaller than wind turbine monopiles and typically result in lower source levels and durations.

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 rigs used in shallower water is less because of limited coupling with the water column. 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 10-2000Hz (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.

Pipelay operations will result mainly in continuous noise (associated with rotating machinery), with relatively little impulse or percussive noise in comparison to many other marine construction activities. The overall source levels resulting from pipelay operations on the UKCS have not been measured, however, near-field cumulative sound levels associated with pipelay for the Clair field development were predicted to be a maximum of 177dB (Lawson *et al*. 2001), with a duration of weeks or months.

Although there is little published data, noise emission from production platforms is thought to be qualitatively similar to that from ships, and is produced mainly by rotating machinery (turbines, generators, compressors) (Richardson *et al*. 1995).

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.

7.3 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 EAs 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.

Brandt *et al.* (2011) reported on the spatial and temporal scale of behavioural responses of harbour porpoises to construction noise at the Horns Rev II offshore wind farm site. Porpoise acoustic activity (measured by passive acoustic monitoring devices (T-PODs)) was reduced by 100% during 1h after pile driving and stayed below normal levels for 24 to 72 h at a distance of 2.6km from the construction site. This period gradually decreased with increasing distance. A negative effect was detectable out to a mean distance of 17.8km. At 22km it was no longer apparent, instead, porpoise activity temporarily increased. This might indicate that porpoises at this distance showed no behavioural reaction to pile driving. Animals moving away from the construction site might have caused porpoise abundance and thus porpoise acoustic activity to temporarily increase as animals aggregated there. Out to a distance of 4.7km, the recovery time was longer than most pauses between pile driving events. Consequently, porpoise activity and possibly abundance were reduced over the entire 5 month construction period.

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).

7.3.1 Injury and behavioural criteria

The Offshore Energy SEAs (DECC 2009b, 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 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) indicative spatial ranges of injury and disturbance for cetaceans and pinnipeds may be calculated as indicated in Table 7.1 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.

Table 7.1: Indicative spatial ranges of various injury and disturbance indicators for cetaceans and pinnipeds

	Cetaceans	**Pinnipeds**
	seismic	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**

Source: Southall et al. (2007)

As part of studies carried out to support consenting of seismic studies in the outer Moray Firth, acoustic modelling studies have been undertaken to predict the variation in noise level with range from an airgun array[11] to be used in the Moray Firth (Kongsberg 2010a, 2010b). The RAM (Collins 1993) and Bellhop acoustic propagation models have been used to estimate transmission loss at 1/3 octave band frequencies from 10Hz to 100kHz. These data have been compared with proposed injury and behavioural response criteria.

Model predictions for four different transects across the Moray Firth indicated that there were some differences in noise propagation losses depending on the season and seabed profiles, with rapid attenuation of high and low level frequencies in shallower waters compared to mid-frequencies of between 500 Hz and 2 kHz. For the purposes of the modelling the peak source level used was 243 dB re.1µPa @ 1m which is based on an airgun with a capacity of 470 cubic inches (much larger than sources used for site survey purposes which may be carried out in Block 17/3). Noise modelling suggests that the airgun noise will remain above

[11] Source level of the airgun array used in the Kongsberg (2010a, 2010b) studies is smaller than that assumed in Table 7.1 above. [11] The nominal centre of the modelled survey area is located at 58°N 03°30'W and in a water depth of 40m.

background sea noise at distances beyond 20km at a frequency of 1 kHz and less than 10km at a frequency of 20 kHz.

Assessment of potential effects on qualifying Annex II species for the Moray Firth and Dornoch Firth and Morrich More SACs used both un-weighted sound exposure level (SEL) and M-weighted SEL as supported in relevant scientific literature (e.g. Southall et al. 2007). The use of M-weighted SEL takes into account the species' specific audiograms; with the hearing of some species being adapted for high frequencies and others low frequencies. Bottlenose dolphins are mid-frequency hearing specialists and using the appropriate filter (Mmf) provides a more appropriate prediction as to likely zones of potential impact. Similar filters (Mpf) have been used for assessing potential impacts on pinnipeds (Southall et al. 2007, Kongsberg 2010b).

The results of the modelling using M-weighted SEL indicates that for bottlenose dolphin the greatest distance at which a permanent threshold shift may occur is 2 metres and for pinnipeds up to 11 metres . The results of the modelling using M-weighted SEL indicates that, for bottlenose dolphin, the maximum distance at which a temporary threshold shift is predicted to occur is 55m in a north-easterly direction, away from the SAC. For pinnipeds the distance, in the same direction, is 75m. Cumulative impacts arising from repeated firing of an airgun have also been modelled, assuming that the vessel will move away from a stationary mammal. The results of the modelling indicate that if the airguns are fired every seven seconds, a bottlenose dolphin not exhibiting avoidance behaviour will be at risk of a permanent threshold shift at a range of less than 5m and temporary threshold shift at a range of 20m. For pinnipeds the permanent threshold shift range is the same, but the temporary threshold shift range to 200m.

The ranges affected by potential auditory injury resulting from modelled seismic survey, in or adjacent to those Blocks where new seismic may be shot (12/16b, 12/17b and 19/4) represent a small proportion of the marine areas used by seals and cetaceans (bottlenose dolphins) associated with European 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 European 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 both within and beyond site boundaries are not expected to have consequent effects on site integrity.

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.

Seismic exploration noise could potentially result in direct effects on seabirds through physical damage, or through disturbance of normal behaviour. Diving seabirds (e.g. auks) may be most at risk of physical damage. 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 little penguins would be high, hence only at short ranges would penguins be adversely affected. Mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere. A study of

seabird abundance in Hudson Strait (Atlantic Canada) during seismic surveys over three years (Stemp 1985) compared periods of shooting and non-shooting, found no significant difference in the abundance of fulmar, kittiwake and thickbilled murre (Brünnich's guillemot). Lacroix *et al*. (2003) in a study of long tailed ducks in the Beaufort Sea, found no difference in indices of site fidelity or diving intensity between the seismic area and two control areas although they could not discount subtle effects. It is therefore considered that offshore seismic noise will not result in significant injury or behavioural disturbance to seabirds in the general area.

7.4 Implications for relevant European 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, although consultation feedback to the previous 25th Round AA indicated that birds associated with the East Caithness Cliffs should also be included. It is noted that effects on fish which are also prey species (e.g. for marine mammals and birds) are unlikely to undermine conservation objectives for relevant features of sites 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. Mandatory Habitats Regulations Assessment procedures will allow further consideration of the nature, timing and location of any planned activities and mitigation measures (see Section 7.5) deemed necessary to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). The screening process (Appendix B) identified the potential for acoustic disturbance in the following sites:

7.4.1 Faray and Holm of Faray SAC

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

The islands, located in the northern part of Orkney, support the second-largest breeding colony in the UK, contributing around 9% of annual UK pup production. 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 2008 was estimated as 18,765, representing a slight decrease over 2007 (-1.0%); the average annual change in pup production for Orkney over the period 2003-2008 is +0.12% (SCOS 2009).

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).

7.4.1.1 Consideration

Simple calculations of sound propagation can be made to estimate the likely maximum received sound levels at the boundaries of relevant European Sites should a typical seismic survey occur in any one of the Blocks applied for; the results of these are presented in Table 7.2. The work programmes for the outer Moray Firth Blocks indicates that 2D seismic survey is proposed for Blocks 12/16b and 12/17b and a 3D seismic survey for Block 19/4. 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. However, several

workers have measured or modelled additional signal modification and attenuation 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 due to reflection, refraction and diffraction in the propagating medium (see SEA 4 Environmental Report). 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). Attenuation of signal with distance is frequency dependent, with stronger attenuation of higher frequencies with increasing distance from the source. Frequency dependence due to destructive interference also forms an important part of the weakening of a noise signal.

Table 7.2: Estimated received sound levels in relevant European Sites associated with a typical seismic survey

	Faray and Holm of Faray SAC		Sanday SAC	
Block	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)
12/14	n/a	n/a	61	158
12/16b	n/a	n/a	91	156
12/17b	n/a	n/a	88	156
12/18	n/a	n/a	79	157
12/19a	n/a	n/a	79	157
12/21b	n/a	n/a	100	155
12/26b	n/a	n/a	118	154
12/27	n/a	n/a	116	154
12/30	n/a	n/a	117	154
13/26a	n/a	n/a	120	154
13/27c	n/a	n/a	134	153
19/01	n/a	n/a	138	153
19/04	n/a	n/a	149	152
	Moray Firth SAC		Dornoch Firth and Morrich More SAC	
Block	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)
12/14	85	156	115	154
12/16b	45	160	77	157
12/17b	55	159	86	156
12/18	66	158	95	155
12/19a	79	157	109	154
12/21b	39	161	68	158
12/26b	28	163	57	159
12/27	39	161	69	157
12/30	71	157	104	155
13/26a	83	156	116	154
13/27c	93	155	127	153
19/01	77	157	116	154
19/04	112	154	151	152

Notes: 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. Work programmes indicate that 2D seismic survey is proposed for Blocks 12/16b and 12/17b.

Propagation has been measured for sounds from pile-driving as well as sounds from operating wind turbines (Madsen *et al*. 2006). For the transient impact sounds from pile-driving, the available data suggest that transmission losses are close to spherical spreading (in the range 11log(R) to 35log(R) up to ranges of more than 1km. Similarly, quantitative modelling of seismic noise propagation in Queen Charlotte Basin, Canada (MacGillivray &

Chapman 2005) predicted that received noise levels would be lowest in those areas of the basin with shallow bathymetry due to scattering and absorption of sound at the seabed.

In the case of Faray and Holm of Faray 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, minimum distance from the Pentland Firth (known to support high densities of foraging grey seals) to the nearest Blocks (12/16b, 12/17b and 12/18) is approximately 30km, giving a propagation loss (assuming 15logR) of around 67dB, or a received sound level of 163dB re 1μPa p-p for a typical seismic survey. This level is considerably lower than the injury criteria proposed by Southall *et al.* (2007) in pinnipeds for both pulsed and non-pulsed sounds, and also below those proposed for the onset of TTS (postulated as significant behavioural disturbance) for pulsed sounds.

While seismic survey occurring in the proposed licence blocks is unlikely to be audible to seals within the SAC itself, noise will be audible over a large area in the outer Moray Firth and waters to the east of the Pentland Firth and Orkney. These areas support relatively high densities of foraging grey seals. The exact effects which this may have are unknown, although available evidence suggests that significant effects at a population or individual level are unlikely.

Noise levels suggested to cause auditory damage in phocids are rapidly attenuated with distance from source, and therefore have very limited potential for spatial overlap with seals foraging beyond the boundary of the SAC. Furthermore, distances over which hearing damage may occur are well within the effective range of the mitigation measures (see Section 7.5) which would be employed to minimise disturbance to marine mammals. Additionally, any future seismic survey plans would be subject to an extensive source- and site-specific assessment of the potential for adverse effects, including AA where necessary.

If significant ecological effects on prey species were to occur, even at considerable distances from Faray and Holm of Faray SAC, 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 grey seals for the site of Faray and Holm of Faray SAC (e.g. affect the distribution of species or supporting habitats, result in significant disturbance to the species or affect the viability of the population).

Noise levels associated with other activities potentially resulting from the 26th Licensing Round such as a drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from seismic survey, and are not expected to have significant effects on relevant qualifying species.

7.4.2 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 favourable (maintained). Derived from aerial surveys of breeding

colonies, the minimum number[12] of harbour seals on Orkney as a whole in 2008 was estimated as 2,900[13] (SCOS 2009). While a high degree of uncertainty surrounds any apparent population trends, SCOS (2009) 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. A targeted research programme has been established including increased monitoring to confirm the magnitude and geographical extent of the declines (SCOS 2009).

Recent studies of foraging at sea by harbour seals have been funded by SNH and DECC (Sharples *et al*. 2005, 2008). These indicate high site fidelity to haul-out sites, but ranging over substantial distances at sea. 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).

7.4.2.1 Consideration

Simple sound propagation calculations suggest received sound levels at the site boundary of 152-158dB re 1μPa p-p for a typical seismic survey occurring in any of the thirteen Blocks applied for (see Table 7.2). This level is considerably lower than the injury criteria proposed by Southall *et al.* (2007) in pinnipeds for both pulsed and non-pulsed sounds, and also below those proposed for the onset of TTS (postulated as significant behavioural disturbance) for pulsed sounds.

Noise from a typical seismic survey in any of the thirteen Blocks applied for is likely to be audible over a large area to the east of the Pentland Firth and Orkney, the northern areas of which support relatively high densities of foraging harbour seals. The exact effects which this may have are unknown, although available evidence suggests that significant effects at a population or individual level are unlikely. Noise levels suggested to cause auditory damage in phocids are rapidly attenuated with distance from source, and therefore have very limited potential for spatial overlap with seals foraging beyond the boundary of the SAC. Furthermore, distances over which hearing damage may occur are well within the effective range of the mitigation measures (see Section 7.5) which would be employed to minimise disturbance to marine mammals. Additionally, any future seismic survey plans would be subject to an extensive source- and site-specific assessment of the potential for adverse effects, including AA where necessary.

If significant ecological effects on prey species were to occur, even at considerable distances from Sanday SAC, 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 of Sanday SAC (e.g. affect the distribution of species or supporting habitats, result in significant disturbance to the species or affect the viability of the population).

Noise levels associated with other activities potentially resulting from the 26th Licensing Round such as a drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from seismic survey, and are not expected to have significant effects on relevant qualifying species.

[12] 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.
[13] Figure rounded to nearest 100.

7.4.3 Moray Firth SAC

(Annex II species: bottlenose dolphin *Tursiops truncatus*)

The Moray Firth SAC represents a core area within the range of the eastern Scottish bottlenose dolphin population. The population ranges from north of the Moray Firth to south of the Firth of Forth, and has occasionally been sighted offshore in the North Sea. In the 1980s, the core of the population's range was focused in the inner Moray Firth, typically within three main areas; the Kessock Channel, Chanonry Narrows, and around the mouth of the Cromarty Firth (Wilson *et al*. 1997, 2004; Hastie *et al*. 2003). While dolphins are seen in these areas throughout the year, an apparent influx of animals is observed from May-September. Since the early 1990s, the population's range has expanded south and now includes waters off Aberdeenshire, St Andrew's Bay and the Firth of Forth (Wilson *et al*. 2004). Dolphins are present year round off Aberdeenshire, with a peak in abundance during March-May (Stockin *et al*. 2006). Peak sightings in St Andrews Bay occur in June-August (Hammond *et al*. 2004). Two social units appear to exist within the population: those which are only observed in the inner Moray Firth, and those which are observed throughout the known range (Lusseau *et al*. 2006).

Surveys along the southern coast of the Moray Firth from 2001-2005 encountered bottlenose dolphins along the majority of the coastline, primarily in waters <25m depth (Robinson *et al*. 2007). Understanding of these animals' offshore distribution is poor due to limited survey effort away from the coast. Occasional visual and acoustic surveys in offshore waters of the Moray Firth have encountered very few bottlenose dolphins (Hastie *et al*. 2003, Talisman 2006, SCANS-II 2008). The Whale and Dolphin Conservation Society coordinated marine mammal surveys of the outer Moray Firth throughout 2008. Cetaceans were encountered during all the surveys including harbour porpoise, minke whales and common dolphins. However, bottlenose dolphins were not seen during the outer Moray Firth surveys in 2008 (Eisfeld *et al.* 2009).

A major study of cetacean distribution, and potentially of responses to seismic noise in the inner-central Moray Firth was initiated by DECC in early 2009. The first report of this study (Thompson *et al*. 2010) indicates that harbour porpoises are the most commonly encountered cetacean throughout inshore and offshore waters of the Moray Firth, and almost all bottlenose dolphin sightings are within 15km of the coast in the inner part of the Moray Firth SAC or the coastal strip along the southern Moray Firth. There are few records of bottlenose dolphins in the outer Moray Firth, with most sightings of dolphins there being of common dolphins or white beaked dolphins. Minke whales appear to be the second most commonly sighted species in offshore waters after harbour porpoises. Similar results were found in the second year of the project (Thompson *et al.* 2011). Acoustic studies detected the presence of harbour porpoise activity almost every day of survey effort (August and September 2010) in many of the offshore sample stations, with most dolphin activity in the inner Moray Firth and along the southern Moray Firth coast. Aerial surveillance revealed high numbers of bottlenose dolphins in these areas, with all dolphin sightings in the outer Moray Firth either common, white beaked or Risso's dolphins. The most common cetacean observed in aerial surveillance was harbour porpoise (230 encounters) with a number of minke whales also observed. A comparison of detection rates (both % days and hours per day detected) at 33 comparable sampling sites for August and September 2009 and 2010 indicated that spatial variation in the occurrence of dolphins and porpoises was consistent between the years. The general pattern, of dolphins being more frequently detected along the south coast of the Moray Firth and porpoises more common at sites further away from shore, was observed in both years.

Based on data primarily from the inner Moray Firth and mouth of the Cromarty Firth, population size in 1992 was estimated as 129 ± 15 individuals (95% CI = 110-174) (Wilson *et al*. 1999). Using the same method, Thompson *et al*. (2004) present abundance estimates based on data over the entire known range of the population to vary between 75-200 from 1990-2002.

Estimates of the number of bottlenose dolphins using the Moray Firth SAC in the period 2002-2007 have been made by Thompson *et al.* (2006, 2009). Point estimates ranged from 71 to 111, with 95% confidence limits ranging from a low of 66 to a high of 161. Recent estimates for the whole Scottish east coast of 193 (95% PI: 162-245) (Thompson *et al.* 2011b) are significantly higher than any of these estimates for the Moray Firth. These estimates were calculated using different analytical methods but the difference nevertheless suggests that not all of the animals in the east coast population use the Moray Firth, as also noted by Thompson *et al*. (2006; 2009, 2011b).

SNH have noted[14] that annual estimates of the number of dolphins using the SAC show considerable variability from year to year, and that the current condition assessment is wholly based on survey observations collected in the summer months and largely concentrated on core areas constituting approximately 30% of the entire SAC area. There is very little information for the remaining 70% of the site. Thompson *et al.* (2011b) report on seasonal differences in the distribution of dolphins inside and outside of the Moray Firth SAC describing several important insights:

- The pattern of reduced winter abundance in the inner Moray Firth that was observed in the early 1990s appears to have been conserved to the present time. Furthermore, other areas of high dolphin occurrence in the outer Moray Firth and eastern coasts to the south (Spey Bay, Aberdeen and St Andrews Bay) appear also to be used less in winter.
- Areas known to be used by dolphins in the summer continued to be used in winter. Within the SAC, detections in the Kessock Channel, Chanonry Narrows and Sutors show a peak during the summer months with dolphins also regularly detected in many winter months; particularly within the Sutors. Elsewhere within the SAC, a seasonal summer peak in occurrence was also seen at Lossiemouth. Detections at Tarbat Ness and Brora, coastal sites in the northern part of the SAC, were generally lower. However, in contrast to the sites in the inner Moray Firth and Lossiemouth, detections tended to be higher in the winter months than in summer. Outside the SAC, detection rates were highest at Spey Bay on the southern Moray Firth coast, and Stonehaven on the Grampian coast. Detections at both of these sites also showed a summer peak.
- No new areas were discovered that were used by dolphins in winter that were not used in summer. However, it was noted that the power of the study to detect significant new areas of use was low, particularly in offshore areas.

Bottlenose dolphins as a feature of the Moray Firth SAC were not considered to be favourable at the time of site designation and, following assessment as part of SNH's programme of Site Condition Monitoring this interest was assessed as unfavourable (recovering) in the first reporting cycle. It is presently unclear whether recent changes in observed dolphin numbers and the usage of the SAC are due to different survey design and modelling (Thompson *et al*. 2011b), long term large scale environmental variability (change) or local anthropogenic effects.

[14] SNH response to 24th Round Appropriate Assessment, Block 17/3, March 2008

The population can be described as vulnerable due its small size and location - at the northernmost limit of its natural range. The population has also been shown to have a low mitochondrial genetic diversity and potentially be geographically isolated (Parsons *et al*. 2002). Management measures are described in the Moray Firth SAC Management Scheme and components such as the Dolphin Space Programme; these are regularly reviewed. At present there is no conclusive evidence for any anthropogenic impacts on the dolphin population, but there are concerns in relation to disturbance/boat traffic, water quality/contamination and fishing activity. These are currently being monitored at a local level and a review of their overall impacts will be assessed in future monitoring reports.

Relevant non-statutory advice from SNH on the sensitivity and vulnerability of the Moray Firth SAC (SNH 2006) indicates that:

- Oil exploration has the potential to cause disturbance or deterioration of dolphin populations or their prey through oil-related development and activities, especially those that may result in seismic activities, the accidental discharge of oil, increased vessel movements, de-fouling of rigs and de-commissioning of installations and infrastructure.
- Seismic surveys associated with oil exploration can affect fish spawning areas on coarse substrate.

7.4.3.1 Consideration

Senior *et al.* (2008) conclude that the propagation of sound within the SAC best fits a cylindrical spreading transmission loss model, and emphasise the difficulties of accurate prediction of the impact of particular noise sources on individual dolphins, or on the population at large. Simple noise propagation calculations suggest maximum received sound levels at the site boundary of 163dB re 1μPa p-p for a typical seismic survey occurring in the closest Block (12/26b) (see Table 7.2), and a lower level of approximately 158dB re 1μPa p-p in the vicinity of areas where dolphins are most frequently recorded (e.g. mouth of Cromarty Firth). The work programmes indicate that 2D seismic is proposed for Blocks 12/16b and 12/17b, 45 and 55km respectively from the site boundary. Maximum received sound levels at the site boundary for a typical seismic survey occurring in these blocks are estimated to be 159-160158dB re 1μPa p-p (a 3D seismic survey is proposed for Block 19/4 but this is significantly further from the site boundary). These levels are considerably lower than the injury criteria proposed by Southall *et al.* (2007) in cetaceans for both pulsed and non-pulsed sounds, and also below those proposed for the onset of TTS (postulated as significant behavioural disturbance) for pulsed sounds.

Seismic survey occurring in the 13 Blocks applied for is likely to be audible to dolphins within a large area of the Moray Firth. The available evidence suggests that significant effects at a population or individual level are unlikely. Noise levels suggested to cause auditory damage in small odontocetes are rapidly attenuated with distance from source, and would therefore not occur within the SAC. Furthermore, the distances over which hearing damage may occur are well within the effective range of the mitigation measures (see Section 7.5) which would be employed to minimise the risk of injury to marine mammals. Additionally, any future seismic survey plans would be subject to an extensive source- and site-specific assessment of the potential for adverse effects, including AA where necessary. Such assessments would be informed by the results of the DECC funded marine mammal research in the inner-central Moray Firth.

DECC recently undertook an Appropriate Assessment in respect of a 2D seismic survey (comprising two airguns with a total capacity of 470 cubic inch and a precautionary noise source level of 243 dB re1. μPa @ 1m) across four separate locations within the Moray Firth: the Braemore, Forse, Berriedale and Helmsdale Prospects, covering a total area of 308.5km^2 (DECC 2010). Noise modelling studies undertaken as part of the AA indicated

that permanent impact on hearing would be extremely unlikely and temporary impacts would only occur if a bottlenose dolphin was within 55 metres or less of the airgun. The range at which bottlenose dolphins may exhibit potential behavioural avoidance was between 1.8km and 11km. It was concluded that any disturbance or displacement would not affect the long-term distribution and abundance of the bottlenose dolphin population nor would it affect the integrity of the site. There would be no significant disturbance of the species and there was a sufficiently large habitat to maintain the population (DECC 2010).

Small odontocetes have been shown to exhibit some avoidance behaviour to seismic survey (Stone & Tasker 2006), therefore there is potential for acoustic disturbance to disrupt foraging activities. However, this is likely to be short-term and infrequent and therefore is not likely to represent a significant disturbance to species, or threaten the long-term viability of the population of the Moray Firth SAC. The Offshore Energy SEA concluded that it was improbable (given the spatial ranges discussed above) that injurious or strong behavioural levels of effect from simultaneous surveys (or other activities) will coincide. However, it was recommended that within the key areas of marine mammal sensitivity, operational criteria are established to limit the cumulative pulse noise "dose" (resulting from seismic survey and offshore pile-driving) to which these areas are subjected.

Noise levels suggested to cause injury to fish (the primary prey species of dolphins) 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 of the Moray Firth SAC, and therefore result in significant effects on relevant qualifying species, including bottlenose dolphin.

Noise levels associated with other activities potentially resulting from the 26th Licensing Round such as a drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from seismic survey, and are not expected to have significant effects on relevant qualifying species.

7.4.4 Dornoch Firth and Morrich More SAC

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

The Dornoch Firth supports a significant proportion of the inner Moray Firth population of the harbour seal and also supports a good population of otters. The condition of the otters at the site has been assessed as favourable (maintained).

7.4.4.1 Consideration

Within the SAC, seals utilise sand-bars and shores at the mouth of the estuary as haul-out and breeding sites. The seals forage outside of the SAC throughout the Moray Firth, with areas of particular importance identified east and north of the Dornoch Firth (Sharples *et al*. 2005, 2008). As indicated in Table 7.2, estimated received noise levels at the SAC boundary from a typical seismic survey in any of the thirteen Blocks applied for are considerably lower than the injury and TTS onset criteria proposed by Southall *et al.* (2007). The semi-enclosed nature of the firth will further limit the propagation of noise into the SAC. While seismic survey occurring in the 13 Blocks applied for may be audible to seals over a larger area of the outer Moray Firth (including known foraging grounds), available evidence suggests that significant effects at a population or individual level are unlikely. Noise levels suggested to cause auditory damage in phocids are rapidly attenuated with distance from source, and would therefore not propagate into the SAC. Distances over which hearing damage may occur are well within the effective range of the mitigation measures (see Section 7.5) which would be employed to minimise disturbance to marine mammals.

Additionally, any future seismic survey plans would be subject to an extensive source- and site-specific assessment of the potential for adverse effects, including AA.

The previously mentioned DECC AA of a seismic survey within the Moray Firth (DECC 2010) also assessed the impact on the Dornoch Firth and Morrich More SAC harbour seal population. Results from noise modelling studies indicated that there could be a potential zone of auditory impact up to 200m away but permanent effects would only occur within 11m. DECC (2010) noted the potential for the disturbance and displacement of seals in the vicinity of the operating airguns with the most precautionary noise model indicating that this may extend up to approximately 5km from the airguns. However, the AA concluded that any displacement or disturbance that may occur would be out with the SAC and for a relatively short duration. There was no evidence that any displaced seals would not be able to forage elsewhere within the Moray Firth (DECC 2011a, 2011b).

Evidence suggests that the extent and magnitude of any such disturbance of prey species of the harbour seal or otter will be localised and small, and therefore highly unlikely to threaten the long-term viability of populations of qualifying species, represent significant disturbance, or a change in the distribution or structure of supporting habitats.

7.4.5 Riverine SACs

The potential for acoustic disturbance effects was identified for the following riverine SACs due to their proximity to the outer Moray Firth Blocks and the presence of Atlantic salmon (unfavourable recovering) as a qualifying feature which travels beyond the site boundaries and into the marine environment: Berriedale and Langwell Waters SAC, River Oykel SAC, River Spey SAC and River Moriston SAC. As stated in Section 5.3, salmonids play a critical role in the life cycle of the freshwater pearl mussel *Margaritifera margaritifera*, which is also a qualifying feature (unfavourable recovering) in the River Oykel, River Spey, River Moriston and River Evelix 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. Following 1-3 years at sea, adult salmon return to their home rivers primarily during summer months. Due to their low densities in the outer Moray Firth and the highly localised range of noise levels likely to cause injury to fish, the potential for acoustic disturbance effects is restricted to disruption to their 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.

The River Spey also maintains populations of sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis* (both favourable maintained). Significant propagation of underwater noise into shallow enclosed and semi-enclosed bays and estuaries is not expected, and therefore the potential for effects is restricted to lamprey occupying marine areas. As with other qualifying anadromous species, the potential for impact can be mitigated through timing of seismic survey to avoid the migratory periods of lamprey entry into the rivers and consequently significant disturbance to this qualifying feature can be avoided.

7.4.6 East Caithness Cliffs SPA

The Article 4.2 species for which the site is designated are breeding guillemot, kittiwake, razorbill, herring gull and shag; and the breeding assemblage of seabirds (the status of the majority of species are favourable maintained although some are unfavourable declining - see Appendix C). For the species for which any evidence is available indicates that significant effects are unlikely. However, the mandatory Habitats Regulations Assessment procedures will allow further consideration of the nature, timing and location of any planned activities and mitigation measures (see Section 7.5) deemed necessary to be defined (including conditions attached to consents/permits or potentially consent/permit refusal).

7.5 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 using *Petroleum Operations Notice No 14* (PON14) supported by an Environmental Narrative to enable an accurate assessment of the environmental effects of the survey. Consultations with Government Departments and other interested parties are conducted prior to issuing consent, and JNCC 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 Appropriate Assessment.

The major operational control and mitigation over seismic surveys in the UK are through JNCC's *Guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys* (August 2010 revision reflects 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 seismic testing 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 (2010) advise that operators adopt mitigation measures which are appropriate to minimise the risk of an injury or disturbance offence[15] and stipulate, whenever possible, the implementation of several best practice measure, including:

- 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.

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

- 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).

Due to the importance of the Moray Firth to marine mammals, DECC will expect that passive acoustic monitoring (PAM) will be routinely used as a mitigation tool. Periods of seasonal concern for seismic survey are also identified for a number of Blocks considered in this AA (see Table 2.1), for which there would be a presumption against such activity taking place.

In addition to marine mammal sensitivities, disturbance to populations of Atlantic salmon and other qualifying anadromous species can be mitigated through timing of seismic survey to avoid migratory periods and consequently significant disturbance can be avoided. In particular JNCC[16] 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.

7.6 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). This would require 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, 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.

Modelling of seismic noise propagation for existing licensed Blocks in the outer Moray Firth has generally concluded that effects in the Moray Firth and Dornoch Firth and Morrich More SACs will not be significant. In the case of the blocks under consideration here, minimum direct linear range to the SAC boundaries is approximately 47km, giving a propagation loss (assuming 15logR) of around 70dB, or a received level at the SAC boundaries of 160dB re 1μPa p-p for a typical seismic survey.

[16] JNCC's response to the 26th Seaward licensing Round.

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 European Sites by undermining the conservation objectives relating to any specific qualifying feature, taking account of the following:

- Should a seismic survey be proposed in Blocks 12/16b and 12/17b (as indicated by the work programme), further Habitats Regulations Assessment would be required to assess the potential for significant effects on site integrity 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 effects will result with significant influence on the integrity of qualifying species within the other SACs in the vicinity of the Blocks.
- The utilisation of areas outside the designated SAC boundaries is not well understood, but the known extensive range of bottlenose dolphins and harbour seals, and available population monitoring indicates that neither previous activities, nor those associated with proposed licensing will have significant influence on the integrity of qualifying species.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities which may include seismic survey will not have an adverse affect on the site integrity of European Sites.

8 In-combination effects

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 causing displacement from foraging areas will be short-term and infrequent. 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." As noted in Section 7, the number of seismic surveys is substantially less than historic peaks and as a result significant in-combination effects with oil and gas activities in existing licensed Blocks are not foreseen. 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 Moray Firth and adjacent areas include those associated with the development of marine renewable energy. Following the Offshore Energy SEA, The Crown Estate have entered a Round 3 zonal development agreement for the generation of up to 1.3 GW of offshore wind energy from a large area in the outer Moray Firth beyond 12nm of the coast; however, the consenting of developments in this area will be subject to detailed project-specific EIA and Habitats Regulations Assessments. The Crown Estate have also recently awarded exclusivity agreements to various consortia of wind energy developers for several areas within Scottish territorial waters, including a 121.3km^2 area off the northeast Moray Firth coast adjacent to the Round 3 development zone. Consenting of any development within this area will also be subject to the conclusions of an SEA (Marine Scotland 2010), project-specific EIA and HRA.

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 ones. The total potential capacity of these sites was 1,200 MW, half of which was for the wave projects and the other half for the tidal ones. Following the withdrawal from the leasing round of the preferred bidder for a particular site known as the Inner Sound, an award was granted in October 2010 to a company for a project of up to 400MW. Consenting of any such developments will be subject to the conclusions of project-specific EIA and HRA.

While the operation, maintenance and decommissioning of marine renewable energy developments will introduce noise into the marine environment, these are typically of low intensity. The greatest noise levels arise during the construction phase, and it is these which have the greatest potential for acoustic disturbance effects (see Faber Maunsell & Metoc 2007, DECC 2009b, 2011). Pile-driving of mono-pile foundations is the principal source of construction noise, which will be qualitatively similar to pile-driving noise resulting from harbour works, bridge construction and oil and gas platform installation. While considerable uncertainty exists over the likely nature and installation method of foundations for future

wave and tidal devices, a precautionary approach to assessment dictates the assumption that some level of pile-driving will occur, at least for tidal energy developments. Mono-pile foundations are the most commonly used for offshore windfarm developments at present, and are likely to be widely utilised in Round 3 and initial Scottish territorial water developments.

In relation to offshore pile-driving, standard conditions on consents for Round 2 offshore wind farms 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 2009) 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 outer Moray Firth Blocks and future marine renewable energy development, there are a variety of other existing (e.g. oil and gas production, wind turbine deployments, fishing, shipping, military exercise areas, wildlife watching cruises) 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 activities discussed above, would adversely affect the integrity of the relevant European 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.

However, the Offshore Energy SEAs (DECC 2009b, 2011) recommended that operational criteria should be established to limit the cumulative pulse noise "dose" (resulting from seismic survey and offshore pile-driving) within specified areas, which included: north and east of Orkney (grey and harbour seals); and, the Moray Firth and coastal waters south to the Forth (bottlenose dolphin) including Smith Bank (grey and harbour seals), inner Firths (harbour seal), St Andrews Bay and outer Forth (grey seals).

The Marine Strategy Framework Directive (2008/56/EC) (MSFD) requires that the European Commission (by 15 July 2010) should lay down criteria and methodological standards to allow consistency in approach in evaluating the extent to which Good Environmental Status (GES) is being achieved. ICES and JRC were contracted to provide scientific support for the Commission in meeting this obligation. A total of 10 reports have been prepared relating to the descriptors of GES listed in Annex I of the Directive.

Task Group 11 reported on underwater noise and other forms of energy (Tasker *et al*. 2010). The Task Group developed three possible indicators of underwater sound. In no case was the Task Group able to define precisely (or even loosely) when Good Environmental Status 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.

DECC is cognisant of the ongoing MSFD Task Group 11 work to determine criteria for an indicator relating to high amplitude, low and mid-frequency impulsive anthropogenic sounds including those from pile driving, seismic surveys and some sonar systems. DECC will review the findings of this Task Group closely with respect to consenting of relevant activities which may result from the draft plan/programme, as well as other activities which generate noise in the marine environment. The establishment of noise criteria and the consenting of activities will require a coordinated approach across different industries and activities, possibly through the future marine planning system.

8.2 Other potential 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 2009b, 2011; see also OSPAR 2000, 2010).

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).

Of particular relevance would be any damage to shallow sandbank habitats (both within and outside designated areas such as the Moray Firth SAC) as these are potentially important foraging areas for bottlenose dolphins and other marine mammals.

In general, cumulative effects are likely to be dominated by trawling, with potential scour and physical damage from cable laying associated with potential offshore wind developments likely to be more important in the future. However, these developments will not be sited in areas where bottlenose dolphins are frequently recorded and therefore are unlikely to have a significant impact on foraging areas.

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 interactions 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 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 the large offshore wind developments that are planned

for the Moray Firth and will likely form an important part of associated Habitats Regulations Assessments.

8.2.3 Marine discharges

As described in Section 6.3, most studies of produced water toxicity and dispersion, in the UK and elsewhere have concluded that the necessary dilution to achieve a No Effect Concentration (NEC) would be reached at <10 to 100m and usually less than 500m from the discharge point. Given the relatively low number and separation of existing oil and gas installations within the Moray Firth and the presumption against the discharge to sea of produced water from new developments, there is unlikely to be a cumulative effect from multiple produced water discharges.

Previous discharges of WBM cuttings in the UKCS have been shown to disperse rapidly and to have minimal ecological effects (Section 6.3). Dispersion of further discharges of mud and cuttings could lead to localised accumulation in areas where reduced current allows the particles to settle on the seabed. However, in view of the scale of the region, the water depths and currents, and probability of reinjection of drill cuttings from any major field development, this is considered unlikely to be detectable and to have negligible cumulative ecological effect (DECC 2011).

8.3 Conclusions

Available evidence for the Moray Firth indicates that past oil and gas activity and discharges has not lead to adverse impacts on the integrity of European sites in the area. The current controls on terrestrial and marine industrial activities, including oil and gas operations that could follow licensing, can be expected to prevent significant in-combination effects affecting relevant European sites.

The competent authorities will assess the potential for in-combination effects during Habitats Regulations Assessments 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. Therefore, bearing this in mind, it is concluded that the in-combination effects from activities arising from the licensing of Blocks 12/14, 12/16b, 12/17b, 12/18, 12/19a, 12/21b, 12/26b, 12/27, 12/30, 13/26a, 13/27c, 19/01 and 19/04 with those from existing and planned activities in the Moray Firth area will not cause an adverse effect on the integrity of the relevant European 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 12/14, 12/16b, 12/17b, 12/18, 12/19a, 12/21b, 12/26b, 12/27, 12/30, 13/26a, 13/27c, 19/01 and 19/04 (considered further in Sections 6-9). 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.og.decc.gov.uk/environment/environ_leg_index.htm and https://www.og.decc.gov.uk/regulation/pons/index.htm) which apply to developer activities which could follow plan adoption. These mitigation measures include, where necessary, project-specific Appropriate Assessments based on detailed project proposals which 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 European 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 assessment will be necessary if, for example, new European 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.

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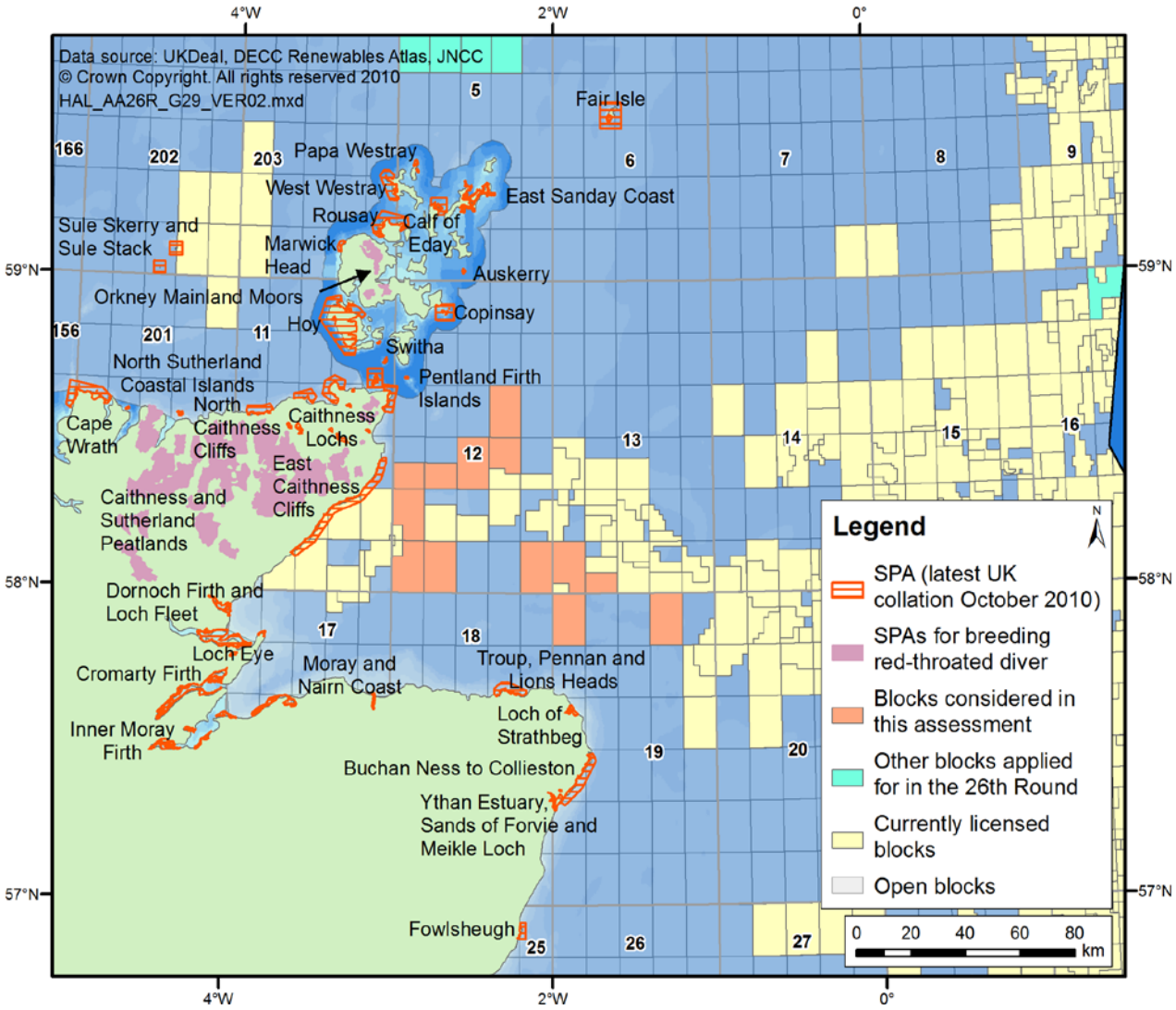
Appendix A – The Sites

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.

A1 Coastal and Marine Special Protection Areas

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[17]
SHETLAND				
Fair Isle SPA	6824.4	Breeding: Arctic tern Fair Isle wren	Breeding: Guillemot	Breeding: Seabird
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 Over winter: Hen harrier	N/A	N/A
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				
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

[17] 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.

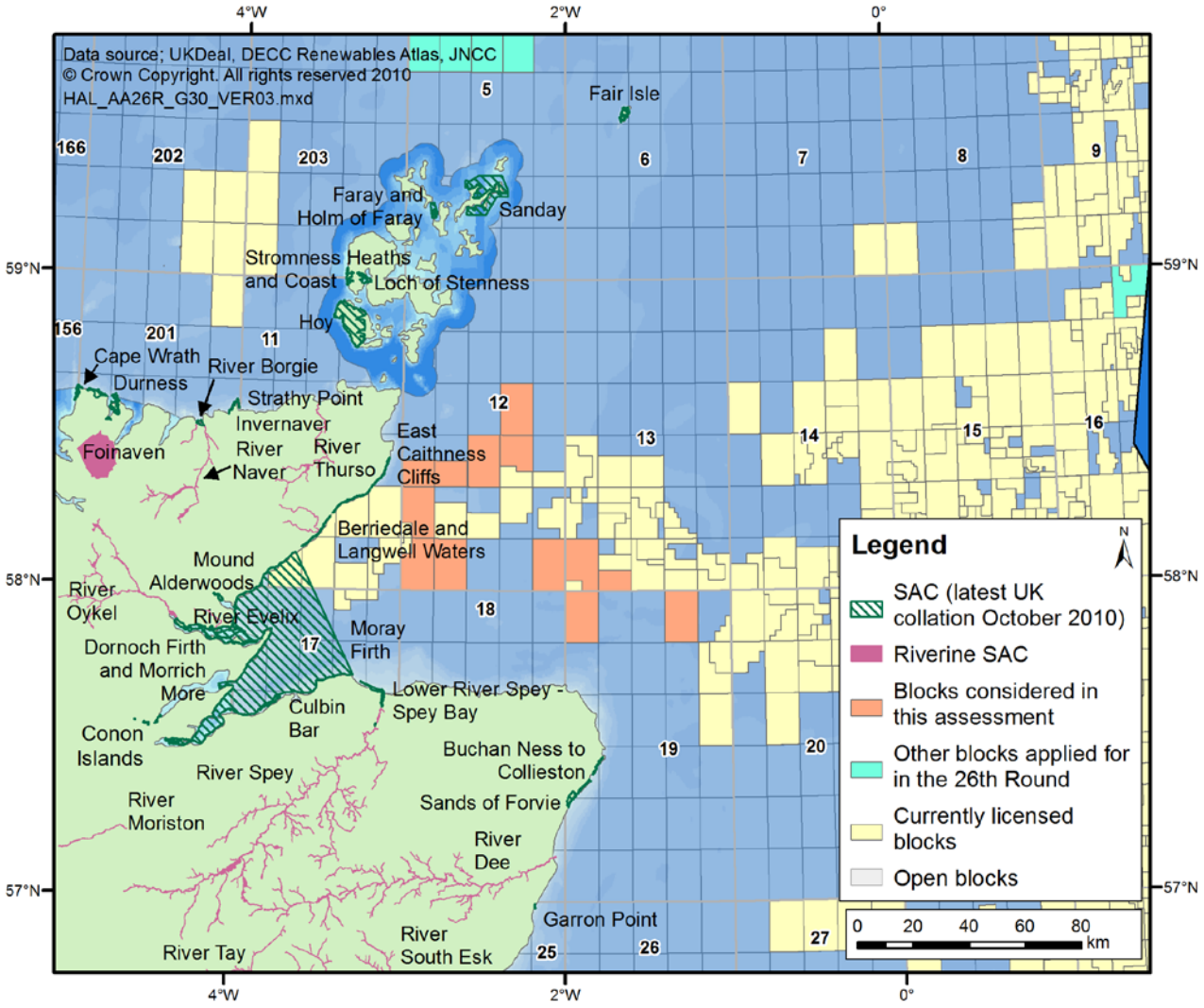
Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages[17]
Caithness and Sutherland Peatlands SPA	145516.75	Breeding: Black-throated diver Golden eagle Golden plover Hen harrier Merlin Red-throated diver Short-eared owl Wood sandpiper	Breeding: Common scoter Dunlin Greenshank Wigeon	N/A
MORAY FIRTH AND ABERDEENSHIRE				
East Caithness Cliffs SPA	11690.92	Breeding: Peregrine	Breeding: Guillemot Kittiwake Razorbill Herring gull Shag	Breeding: Seabirds
Dornoch Firth and Loch Fleet SPA	7836.33	Breeding: Osprey Over winter: Bar-tailed godwit	Over winter: Greylag goose Wigeon	Over winter: Waterfowl
Loch Eye SPA	205.14	Over winter: Whooper swan	Over winter: Greylag goose	N/A
Cromarty Firth SPA	3766.24	Breeding: Common tern Osprey Over winter: Bar-tailed godwit Whooper swan	Over winter: Greylag goose	Over winter: Waterfowl
Inner Moray Firth SPA	2339.23	Breeding: Common tern Osprey Over winter: Bar-tailed godwit	Over winter: Greylag goose Red-breasted merganser Redshank Scaup	Over winter: Waterfowl
Moray and Nairn Coast SPA	2410.25	Breeding: Osprey Over winter: Bar-tailed godwit	Over winter: Greylag goose Pink-footed goose Redshank	Over winter: Waterfowl
Troup, Pennan and Lion's Heads SPA	3367.21	N/A	Breeding: Guillemot	Breeding: Seabirds
Loch of Strathbeg SPA	615.94	Breeding: Sandwich tern Over winter: Barnacle goose Whooper swan	Over winter: Greylag goose Pink-footed goose	Over winter: Waterfowl
Buchan Ness to Collieston Coast SPA	5400.94	N/A	N/A	Breeding: Seabirds
Ythan Estuary, Sands of Forvie and Meikle Loch SPA	1016.24	Breeding: Common tern Little tern Sandwich tern	Over winter: Pink-footed goose	Over winter: Waterfowl
Fowlsheugh SPA	1303.54	N/A	Breeding: Guillemot Kittiwake	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. 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.

Abbreviations for the Annex 1 habitats used in SAC site summaries (Tables A.2 and A.3 and Map A.2) are listed in Box A.2.

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

Annex I Habitat (abbreviated)	Annex I Habitat(s) (full description)
Machairs	Machairs
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 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
SHETLAND					
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
NORTH COAST OF SCOTLAND					
Cape Wrath SAC	1018.18	Sea cliffs	N/A	N/A	N/A
Foinaven SAC	14845.6	Standing freshwater Heath Grasslands Scree Rocky slope	Grasslands Bogs Rocky slopes	N/A	Freshwater pearl mussel *Margaritifera margaritifera* Otter *Lutra lutra*
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
Mound Alderwoods SAC	297.33	Forests	N/A	N/A	N/A
Moray Firth SAC	151341.67	N/A	Sandbanks	Bottlenose dolphin *Tursiops truncatus*	N/A

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Dornoch Firth and Morrich More SAC	8700.53	Estuaries Mudflats and sandflats Saltmarsh and saltmeadows Salt meadows Coastal dunes	Sandbanks Reefs	Otter *Lutra lutra* Harbour seal *Phoca vitulina*	N/A
Conon Islands SAC	120.11	Forests	N/A	N/A	N/A
Culbin Bar SAC	612.88	Vegetation of stony banks	Salt meadows Coastal dunes	N/A	N/A
Lower River Spey - Spey Bay SAC	652.6	Vegetation of stony banks Forests	N/A	N/A	N/A
Buchan Ness to Collieston SAC	207.52	Sea cliffs	N/A	N/A	N/A
Sands of Forvie SAC	734.05	Coastal dunes	N/A	N/A	N/A
SOUTH OF ABERDEENSHIRE					
Garron Point SAC	15.58	N/A	N/A	Narrow-mouthed whorl snail *Vertigo angustior*	N/A

A3 Offshore Special Areas of Conservation

There are no offshore SACs close enough to the outer Moray Firth blocks applied for (listed in Section 1.2), for there to be foreseeable effects on site integrity.

A4 Riverine Special Areas of Conservation

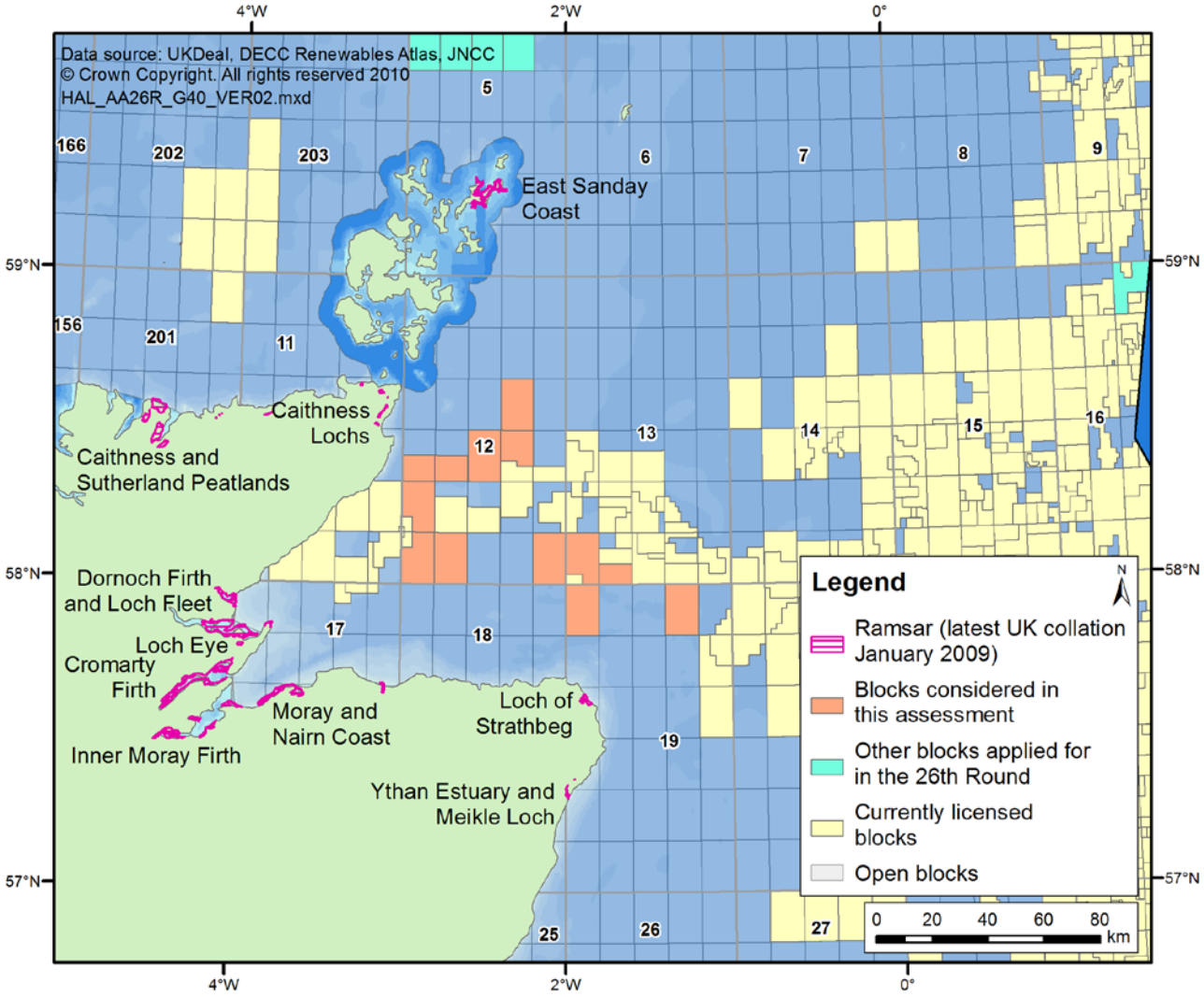
Table A.3: Riverine SACs designated for migratory fish and/or the freshwater pearl mussel

Site Name	Freshwater pearl mussel *Margaritifera margaritifera*	Migratory fish[1]
River Borgie	✓	AS
River Naver	✓	AS
River Thurso	-	AS
Berriedale and Langwell Waters	-	AS
River Evelix	✓	-
River Oykel	✓	AS
River Moriston	✓	AS
River Spey	✓	SL, AS
River Dee	✓	AS
River South Esk	✓	AS
River Tay	-	SL, RL, AS

[1] *SL - Sea lamprey Petromyzon marinus, RL - River lamprey Lampetra fluviatilis, AS - Atlantic salmon Salmo salar*

A5 Ramsar sites

Map A.3L: 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.4: Coastal Ramsar sites and corresponding Natura 2000 sites

Ramsar name	SPA name	SAC name
Caithness and Sutherland Peatlands	Caithness and Sutherland Peatlands	Caithness and Sutherland Peatlands
Caithness Lochs	Caithness Lochs	-
Cromarty Firth	Cromarty Firth	-
Dornoch Firth and Loch Fleet	Dornoch Firth and Loch Fleet	Dornoch Firth and Morrich More
East Sanday Coast	East Sanday Coast	Sanday
Inner Moray Firth	Inner Moray Firth	Moray Firth

Ramsar name	SPA name	SAC name
Loch Eye	Loch Eye	Dornoch Firth and Morrich More
Loch of Strathbeg	Loch of Strathbeg	-
Moray and Nairn Coast	Moray and Nairn Coast	-
Ythan Estuary and Meikle Loch	Ythan Estuary, Sands of Forvie and Meikle Loch	Sands of Forvie

Appendix B – Screening tables for the identification of likely significant effects on the sites

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								
Fair Isle	✓	-	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
ORKNEY								
Pentland Firth Islands	✓	-	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 (Arctic tern) will not be affected by foreseeable in-combination effects.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Switha	-	✓	-	-	-	-	-	Due to nature of feature present (barnacle goose), site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Orkney Mainland Moors	✓	✓	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 (red-throated diver) will not be affected by foreseeable in-combination effects.
Hoy	✓	-	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 seabirds) will not be affected by foreseeable in-combination effects.
Marwick Head	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Rousay	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
West Westray	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Papa Westray (North Hill and Holm)	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Calf of Eday	✓	-	-		-	-		Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
East Sanday Coast	-	✓	-	✓	-	-	✓	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, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 (over-wintering birds) will not be affected by foreseeable in-combination effects.
Auskerry	✓	-	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 seabirds) will not be affected by foreseeable in-combination effects.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Copinsay	✓	-	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 seabirds) will not be affected by foreseeable in-combination effects.
Sule Skerry and Sule Stack	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
NORTH COAST OF SCOTLAND								
Cape Wrath	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
North Sutherland Coastal Islands	-	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
North Caithness Cliffs	✓	-	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 seabirds) will not be affected by foreseeable in-combination effects.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Caithness and Sutherland Peatlands	✓	-	-	✓	-	-	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2) and breeding red throated diver would only be exposed to spill whilst foraging in coastal waters outside of the site. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. 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 will not be affected by foreseeable in-combination effects.
Caithness lochs	-	✓	-	-	-	-	-	Due to nature of features present (over-wintering geese), site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
MORAY FIRTH AND ABERDEENSHIRE								
East Caithness Cliffs	✓	-	-	✓	-	✓	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the features present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. It is noted that this site could potentially be influenced by renewable (offshore wind) energy developments in the outer Moray Firth area; however, population integrity of the qualifying species (breeding seabirds) will not be affected by foreseeable in-combination effects.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Dornoch Firth and Loch Fleet	✓	✓	-	✓	-	-	✓	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, weathered spilled oil could theoretically affect the features present (over-wintering waterfowl and waders), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Loch Eye	-	✓	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the qualifying features (over-wintering waterfowl) when foraging in adjacent firths beyond the site boundaries. However, mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Cromarty Firth	✓	✓	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the features present (breeding tern, osprey, overwintering waterfowl), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Inner Moray Firth	✓	✓	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the features present (breeding tern, osprey, overwintering waterfowl), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Moray and Nairn Coast	✓	✓	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the features present (overwintering waterfowl and sea ducks which feed in the Moray Firth), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Troup, Pennan and Lion's Heads	✓	-	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the features present (breeding seabirds), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Loch of Strathberg	✓	✓	-	✓	-	-	-	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, weathered spilled oil could theoretically affect the feature present (breeding tern which feed in adjacent waters), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Buchan Ness to Collieston Coast	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Ythan Estuary, Sands of Forvie and Meikle Loch	✓	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Fowlsheugh	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

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							
Fair Isle	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
ORKNEY							
Hoy	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Loch of Stenness	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Stromness Heaths and Coasts	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Faray and Holm of Faray	-	✓	✓	-	✓	✓	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 qualifying species (grey seal), although effects on site conservation status are unlikely in the long term (see Sections 7.3 and 7.4). In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the feature present, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. It is noted that this site could potentially be influenced by renewable energy developments in the outer Moray Firth (offshore wind) and Pentland Firth areas; however, population integrity of the qualifying species will not be affected by foreseeable in-combination effects.

Site name	Features present[1]		Vulnerability to Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Sanday	✓	✓	✓	-	✓	✓	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 qualifying species feature (harbour seal), although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4). In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect some of the features present (mudflats and sandflats, harbour seal), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. It is noted that this site could potentially be influenced by renewable energy developments in the outer Moray Firth (offshore wind) and Pentland Firth areas; however, population integrity of the qualifying species will not be affected by foreseeable in-combination effects.
NORTH COAST OF SCOTLAND							
Cape Wrath	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Foinaven	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Durness	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Invernaver	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Strathy Point	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

Site name	Features present[1]		Vulnerability to Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
MORAY FIRTH AND ABERDEENSHIRE							
East Caithness Cliffs	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Mound Alderwoods	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Moray Firth	✓	✓	✓	-	✓	✓	Site 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 qualifying species feature (bottlenose dolphin), although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4). In the unlikely event of a major crude oil spill, weathered spilled oil could theoretically affect the species feature both within the SAC and when forging more widely (the species feature maintains the same level of protection when outside site boundaries), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. It is noted that this site could potentially be influenced by renewable energy developments in the outer Moray Firth (offshore wind) area; however, population integrity of the qualifying species will not be affected by foreseeable in-combination effects.

Site name	Features present[1]		Vulnerability to Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Dornoch Firth and Morrich More	✓	✓	✓	-	✓	✓	Site 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 features (harbour seal and otter), although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4). In the unlikely event of a major crude or fuel oil spill, weathered spilled oil could theoretically affect several habitat and species features, although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. It is noted that this site could potentially be influenced by renewable energy developments in the outer Moray Firth (offshore wind) area; however, population integrity of the qualifying species will not be affected by foreseeable in-combination effects.
Conon Islands	✓	-	-	-	-	-	Due to nature of the qualifying feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Culbin Bar	✓	-	✓	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major crude or fuel oil spill, weathered spilled oil could theoretically affect the features present (salt meadows), although mitigation would be possible (see Section 5.4 and Table 4.2). Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Lower River Spey - Spey Bay	✓	-	-	-	-	-	Due to nature of feature(s) present, site conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Buchan Ness to Collieston	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Sands of Forvie	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

Site name	Features present[1]		Vulnerability to Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
SOUTH OF ABERDEENSHIRE							
Garron Point	-	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

B3 Riverine Special Areas of Conservation

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
River Borgie	-	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
River Naver	-	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be affected by emissions or discharges from routine operations or accidental spills.
River Thurso	-	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be affected by emissions or discharges from routine operations or accidental spills.
Berriedale and Langwell Waters	-	✓	-	-	✓	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (Atlantic salmon) outside of the site boundaries, although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4).
River Evelix	-	✓	-	-	-	-	Site is remote from blocks and the conservation objectives of its interest feature (freshwater pearl mussel) would not be undermined by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to migratory salmonids (the gills of which provide an essential mode of dispersal for mussel larvae) outside of the site boundaries. However, such indirect effects are highly unlikely to compromise conservation status in the long-term (see Section 7.3).

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
River Oykel	-	✓	-	-	✓	-	Site is remote from blocks and the conservation objectives of its interest feature (freshwater pearl mussel) would not be undermined by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (Atlantic salmon) outside of the site boundaries, although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4). The gills of migratory salmonids provide an essential mode of dispersal for the larvae of the species feature (freshwater pearl mussel); despite the potential for temporary acoustic disturbance of such salmonids outside of the site boundaries, effects on conservation status in the long-term are highly unlikely (see Section 7.3).
River Moriston	-	✓	-	-	✓	-	Site is remote from blocks and the conservation objectives of its interest feature (freshwater pearl mussel) would not be undermined by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (Atlantic salmon) outside of the site boundaries, although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4). The gills of migratory salmonids provide an essential mode of dispersal for the larvae of the species feature (freshwater pearl mussel); despite the potential for temporary acoustic disturbance of such salmonids outside of the site boundaries, effects on conservation status in the long-term are highly unlikely (see Section 7.3).

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
River Spey	-	✓	-	-	✓	-	Site is remote from blocks and the conservation objectives of its interest feature (freshwater pearl mussel) would not be undermined by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species features (Atlantic salmon, sea lamprey) outside of the site boundaries, although effects on conservation status in the long-term are unlikely (see Sections 7.3 and 7.4). The gills of migratory salmonids provide an essential mode of dispersal for the larvae of the species feature (freshwater pearl mussel); despite the potential for temporary acoustic disturbance of such salmonids outside of the site boundaries, effects on conservation status in the long-term are highly unlikely (see Section 7.3).
River Dee	-	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
River South Esk	-	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
River Tay	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

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: Fair Isle SPA	
Location	Grid Ref: HZ216724 (central point) Latitude 59º32'15"N Longitude 01º37'00"W
Area (ha)	6824.4
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: Pentland Firth Islands SPA	
Location	Grid Ref: ND387842 (central point) Latitude 58º44'30"N Longitude 03º03'30"W
Area (ha)	170.51
Summary	The Pentland Firth Islands are located between the Orkney Islands and the mainland coast of northeast Scotland. They are a group of two main islands, Swona and Muckle Skerry, and a group of rocky skerries in the Pentland Firth. The islands contain a variety of habitats, including cliffs, rocky shores, maritime heath, moorland, rough grassland, marsh and open freshwater. They provide strategic nesting localities for Arctic tern which feed outside the SPA in the rich surrounding waters of the Pentland Firth.
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 (4 year mean 1992-1995) [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: Orkney Mainland Moors SPA	
Location	Grid Ref: HY351223 (central point) Latitude 59º05'00"N Longitude 03º08'00"W
Area (ha)	4444.35
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: Hoy SPA	
Location	Grid Ref: ND238974 (central point) Latitude 58º51'30"N Longitude 03º19'10"W
Area (ha)	18122.17
Summary	Hoy is one of the most southerly of the major islands of the Orkney archipelago in northern Scotland. The Hoy SPA covers the northern and western two-thirds of the island, which is formed of Old Red Sandstone and contains Orkney's highest hills. Most of the island is moorland, drained by numerous streams with diverse vegetation. On the west coast, Old Red Sandstone cliffs reach 339m in height and include a number of notable stacks and crags. These cliffs provide important breeding sites for a number of seabird species, especially gulls and auks, whilst moorland areas support large numbers of breeding birds, in particular great skua. Red-throated diver nest on the numerous small lochans found on the moorland. The divers and seabirds feed in the rich waters around Hoy, 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:** Peregrine *Falco peregrinus*, 6 pairs representing at least 0.5% of the breeding population in Great Britain (Mid-1990s) [favourable maintained] Red-throated diver *Gavia stellata*, 56 pairs representing at least 6.0% of the breeding population in Great Britain (1994 National Survey) [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:** Great skua *Catharacta skua*, 1,900 pairs representing at least 14.0% of the breeding World population (Seabird Census Register) [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 120,000 individual seabirds including: puffin *Fratercula arctica*, guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, great black-backed gull *Larus marinus*, Arctic skua *Stercorarius parasiticus*, fulmar *Fulmarus glacialis* and great skua *Catharacta skua* [all favourable maintained, except puffin and kittiwake: 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: East Sanday Coast SPA	
Location	Grid Ref: HY676423 (central point) Latitude 59º16'00"N Longitude 02º34'00"W
Area (ha)	1515.23
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)	3607.7
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: North Caithness Cliffs SPA	
Location	Grid Ref: ND182743 (central point) Latitude 58º39'00"N Longitude 03º24'30"W
Area (ha)	14621.14
Summary	The North Caithness Cliffs SPA is located on the north coast of Caithness in northern Scotland. The site comprises most of the sea-cliff areas between Red Point and Duncansby Head on the north mainland coast, and the western cliffs on the island of Stroma. Cliff ledges, stacks and geos provide ideal nesting sites for important populations of seabirds, especially gulls and auks. The seabirds nesting on the North Caithness Cliffs feed outside the SPA in the surrounding waters of the Pentland Firth, as well as further afield. The cliffs also provide important nesting habitat for peregrine *Falco peregrinus.*
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:** Peregrine *Falco peregrinus*, 6 pairs representing at least 0.5% of the breeding population in Great Britain (Mid-1990s) [N/A]	
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*, 26,994 pairs representing at least 1.2% of the breeding East Atlantic population (Count as at 1987) [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 110,000 individual seabirds including: puffin *Fratercula arctica*, razorbill *Alca torda*, kittiwake *Rissa tridactyla*, fulmar *Fulmarus glacialis*, guillemot *Uria aalge* [favourable maintained, except kittiwake and razorbill: 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: Caithness and Sutherland Peatlands SPA	
Location	Grid Ref: NC866402 (central point) Latitude 58º20'10"N Longitude 03º56'15"W
Area (ha)	145,516.75
Summary	The Caithness & Sutherland Peatlands are located across the northernmost parts of mainland Scotland. The SPA contains a large proportion of these peatlands, which form one of the largest and most intact areas of blanket bog in the world. The peatlands include an exceptionally wide range of vegetation and surface pattern types (pool systems), some of which are unknown elsewhere. This range of structurally diverse peatland and freshwater habitats supports a wide variety of breeding birds including internationally important populations of raptors, wildfowl and 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:

During the breeding season:
Black-throated diver *Gavia arctica*, 26 pairs representing at least 16.3% of the breeding population in Great Britain (11 year mean, 1986-1996) [favourable maintained]

Golden eagle *Aquila chrysaetos*, 5 pairs representing at least 1.3% of the breeding population in Great Britain (Count, as at 1992) [favourable maintained]

Golden plover *Pluvialis apricaria*, 1,064 pairs representing at least 4.7% of the breeding population in Great Britain (Count, as at mid-1990s) [favourable maintained]

Hen harrier *Circus cyaneus*, 14 pairs representing at least 2.8% of the breeding population in Great Britain (5 year mean, 1993-1997) [favourable maintained]

Merlin *Falco columbarius*, 54 pairs representing at least 4.2% of the breeding population in Great Britain (Count, as at early 1990s) [favourable maintained]

Red-throated diver *Gavia stellata*, 89 pairs representing at least 9.5% of the breeding population in Great Britain (Two year mean, 1993-1994)

Short-eared owl *Asio flammeus*, 30 pairs representing at least 3.0% of the breeding population in Great Britain (Count, as at mid-1990s)

Wood sandpiper *Tringa glareola*, 5 pairs representing up to 50.0% of the breeding population in Great Britain (Two year mean, 1994-1995) [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:
Common scoter *Melanitta nigra*, 27 pairs representing <0.1% of the breeding Western Siberia/Western & Northern Europe/Northwestern Africa population (1996) [favourable maintained]

Dunlin *Calidris alpina schinzii*, 1,860 pairs representing at least 16.9% of the breeding Baltic/UK/Ireland population (Count, as at 1994) [favourable maintained]

Greenshank *Tringa nebularia*, 256 pairs representing at least 0.4% of the breeding Europe/Western Africa population (1994/95) [favourable maintained]

Wigeon *Anas penelope*, 43 pairs representing <0.1% of the breeding Western Siberia/Northwestern/Northeastern Europe population (1994)

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

Site Name: Caithness and Sutherland Peatlands SPA	
• 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 Caithness Cliffs SPA	
Location	Grid Ref: ND214331 (central point) Latitude 58º16'49"N Longitude 03º20'21"W
Area (ha)	11690.92
Summary	The East Caithness Cliffs SPA is located on the east coast of Caithness in northern Scotland. The site comprises most of the sea-cliff areas between Wick and Helmsdale. The cliffs are formed from Old Red Sandstone and are generally between 30-60m high, rising to 150m at Berriedale. Cliff ledges, stacks and geos provide ideal nesting sites for internationally important populations of seabirds, especially gulls and auks. The seabirds nesting on the East Caithness Cliffs feed outside the SPA in inshore waters as well as further away. The cliffs also provide important nesting habitat for peregrine. The cliffs overlook the Moray Firth, an area that provides rich feeding areas for fish-eating seabirds.
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:** Peregrine *Falco peregrinus*, 6 pairs representing at least 0.5% of the breeding population in Great Britain (Mid-1990s)	
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*, 71,509 pairs representing at least 3.2% of the breeding East Atlantic population (Count as at 1986) [favourable maintained] Herring Gull *Larus argentatus*, 9,370 pairs representing at least 1.0% of the breeding Northwestern Europe (breeding) and Iceland/Western Europe - breeding population (Count, as at 1986) [unfavourable declining] Kittiwake *Rissa tridactyla*, 31,930 pairs representing at least 1.0% of the breeding Eastern Atlantic - Breeding population (Count, as at 1986) [favourable maintained] Razorbill *Alca torda*, 9,259 pairs representing at least 1.6% of the breeding population (1986) [favourable maintained] Shag *Phalacrocorax aristotelis*, 2,345 pairs representing at least 1.9% of the breeding Northern Europe population (Count as at 1986) [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 300,000 individual seabirds including: puffin *Fratercula arctica*, great black-backed gull *Larus marinus*, cormorant *Phalacrocorax carbo*, fulmar *Fulmarus glacialis*, razorbill *Alca torda*, guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, herring gull *Larus argentatus*, shag *Phalacrocorax aristotelis* [favourable maintained, except shag, cormorant, great black-backed gull and herring gull: 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: Dornoch Firth and Loch Fleet SPA	
Location	Grid Ref: NH788862 (central point) Latitude 57º51'00"N Longitude 04º02'30"W
Area (ha)	7836.33
Summary	The Dornoch Firth is located in north-eastern Scotland and is one of the two northernmost estuaries in the Moray Basin ecosystem. The Dornoch Firth and Loch Fleet SPA is one of the best examples in northwest Europe of a large complex estuary which has been relatively unaffected by industrial development, whilst Loch Fleet itself is an example of a shallow, bar-built estuary. Extensive sand-flats and mud-flats are backed by saltmarsh and sand dunes with transitions to dune heath and alder woodland. The tidal flats support internationally important numbers of waterbirds on migration and in winter, and are the most northerly and substantial extent of intertidal habitat for wintering waterbirds in the UK, as well as Europe. The Firth is also of importance as a feeding area for locally breeding osprey. Dornoch Firth and Loch Fleet SPA forms an integral ecological component of Moray Basin Firths and Bays of which it forms the most northerly component area.
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:** Osprey *Pandion haliaetus*, 10 pairs representing at least 10.0% of the breeding population in Great Britain (Count as at early 1990's) [favourable maintained] **Over winter:** Bar-tailed Godwit *Limosa lapponica*, 1,300 individuals representing at least 2.5% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) [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:** Greylag Goose *Anser anser,* 2,079 individuals representing at least 2.1% of the wintering Iceland/UK/Ireland population (5 year peak mean 1991/2 - 1995/6) [favourable maintained] Wigeon *Anas penelope*, 15,304 individuals representing at least 1.2% of the wintering Western Siberia/Northwestern/Northeastern Europe population (5 year peak mean 1989/90-1993/4) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance. Over winter, the area regularly supports 34,837 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: curlew *Numenius arquata*, dunlin *Calidris alpina alpina*, oystercatcher *Haematopus ostralegus*, teal *Anas crecca*, wigeon *Anas penelope*, greylag goose *Anser anser,* bar-tailed godwit *Limosa lapponica* [all 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: Cromarty Firth SPA	
Location	Grid Ref: NH688680 (central point) Latitude 57º41'00"N Longitude 04º12'00"W
Area (ha)	3766.24
Summary	The Cromarty Firth is located in north-eastern Scotland and is one of the major firths on the east shore of the Moray Firth. It contains a range of high-quality coastal habitats including extensive intertidal mud-flats and shingle bordered locally by areas of saltmarsh, as well as reedbeds around Dingwall. The rich invertebrate fauna of the intertidal flats, with beds of eelgrass *Zostera* spp., glasswort *Salicornia* spp., and *Enteromorpha* algae, all provide important food sources for large numbers of wintering and migrating waterbirds (swans, geese, ducks and waders). With adjacent estuarine areas elsewhere in the Moray Firth, it is the most northerly major wintering area for wildfowl and waders in Europe. The Firth is also of importance as a feeding area for locally breeding Osprey as well as for breeding terns. Cromarty Firth SPA forms an integral ecological component of Moray Basin Firths and Bays.
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:** Common Tern *Sterna hirundo*, 294 pairs representing at least 2.4% of the breeding population in Great Britain (5 year mean, 1989-1993) [unfavourable no change] Osprey *Pandion haliaetus*, 1 pairs representing at least 1.0% of the breeding population in Great Britain (Early 1990s) [favourable maintained] **Over winter:** Bar-tailed Godwit *Limosa lapponica*, 1,420 individuals representing at least 2.7% of the wintering population in Great Britain (winter peak mean) [favourable maintained] Whooper Swan *Cygnus cygnus,* 55 individuals representing at least 1.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) [unfavourable no change]	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **Over winter:** Greylag Goose *Anser anser,* 1,777 individuals representing at least 1.8% of the wintering Iceland/UK/Ireland population (winter peak mean) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance. Over winter, the area regularly supports 34,847 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: redshank *Tringa totanus*, curlew *Numenius arquata*, dunlin *Calidris alpina alpina*, knot *Calidris canutus*, oystercatcher *Haematopus ostralegus*, red-breasted merganser *Mergus serrator*, scaup *Aythya marila*, pintail *Anas acuta*, wigeon *Anas penelope*, greylag goose *Anser anser,* bar-tailed godwit *Limosa lapponica*, whooper swan *Cygnus cygnus* [favourable maintained, except whooper swan, scaup and common tern: unfavourable no change]	
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: Inner Moray Firth SPA	
Location	Grid Ref: NN564745 (central point) Latitude 56º50'25"N Longitude 04º21'15"W
Area (ha)	2339.23
Summary	The Inner Moray Firth is located to the north of Inverness in Scotland and is one of the major arms of the Moray Firth. It comprises the Beauly Firth and Inverness Firth (including Munlochy Bay) which together form the easternmost estuarine component of the Moray Basin ecosystem. The site contains extensive intertidal flats and smaller areas of saltmarsh. The rich invertebrate fauna of the intertidal flats, with beds of eelgrass *Zostera spp*., glasswort *Salicornia spp*., and *Enteromorpha* algae, all provide important food sources for large numbers of wintering and migrating waterbirds (geese, ducks and waders). With adjacent estuarine areas elsewhere in the Moray Firth, this site is the most northerly major wintering area for wildfowl and waders in Europe. The Firth is also of importance as a feeding area for locally breeding osprey as well as for breeding terns. The Inner Moray Firth SPA forms an integral ecological component of Moray Basin Firths and Bays.
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:** Common tern *Sterna hirundo*, 310 pairs representing at least 2.5% of the breeding population in Great Britain (Seabird Census Register) [unfavourable no change] Osprey *Pandion haliaetus*, 4 pairs representing at least 4.0% of the breeding population in Great Britain (Early 1990s) [favourable maintained] **Over winter:** Bar-tailed godwit *Limosa lapponica*, 1,155 individuals representing at least 2.2% of the wintering population in Great Britain (winter peak mean) [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:** Greylag goose *Anser anser,* 1,731 individuals representing at least 1.7% of the wintering Iceland/UK/Ireland population (winter peak mean) [favourable maintained] Red-breasted merganser *Mergus serrator*, 1,731 individuals representing at least 1.4% of the wintering Northwestern/Central Europe population (winter peak mean) [unfavourable no change] Redshank *Tringa totanus*, 1,811 individuals representing at least 1.2% of the wintering Eastern Atlantic - wintering population (winter peak mean) [favourable maintained] Scaup *Aythya marila*, 97 individuals representing <0.1% of the wintering Northern/Western Europe population (Counts 1991-96) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance. Over winter, the area regularly supports 33,148 individual waterfowl (5 year peak mean 1991/2 - 1995/6), including: scaup *Aythya marila*, curlew *Numenius arquata*, oystercatcher *Haematopus ostralegus*, goosander *Mergus merganser*, goldeneye *Bucephala clangula*, teal *Anas crecca*, wigeon *Anas penelope*, cormorant *Phalacrocorax carbo*, redshank *Tringa totanus*, red-breasted merganser *Mergus serrator*, greylag goose *Anser anser,* bar-tailed godwit *Limosa lapponica* [favourable maintained, except cormorant, red-breasted merganser and goosander: unfavourable no change]	
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	

Site Name: Inner Moray Firth SPA	
• No significant disturbance of the species	
Site Name: Loch Eye SPA	
Location	Grid Ref: NH831797 (central point) Latitude 57º47'30"N Longitude 03º58'00"W
Area (ha)	205.14
Summary	Loch Eye is located between the Cromarty and Dornoch Firths in the Highland region of Scotland. It is a relatively large, shallow, nutrient-rich inland water body, and is the best example of a eutrophic lowland loch north of the Highland boundary fault. The loch and surrounding area supports a diverse range of plant communities. In winter, the loch is an important roosting site for internationally important numbers of waterbirds, especially whooper swan and Icelandic greylag goose. The waterbirds using Loch Eye move on a regular basis between the loch and the nearby Dornoch and Cromarty Firths where there are abundant feeding opportunities, although the geese feed in surrounding areas of agricultural land outside the SPA. The loch is thus an integral component of the wider Moray Basin ecosystem.
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:** Whooper swan *Cygnus cygnus,* 213 individuals representing at least 3.9% of the wintering population in Great Britain (WeBS 5 year peak mean 1991/2-1995/6) [unfavourable no change]	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: **Over winter:** Greylag goose *Anser anser,* 11,321 individuals representing at least 11.3% of the wintering Iceland/UK/Ireland population (5 year peak mean 1991/2 - 1995/6) [unfavourable no change]	
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: Moray and Nairn Coast SPA	
Location	Grid Ref: NH967633 (central point) Latitude 57º38'54"N Longitude 03º43'48"W
Area (ha)	2410.25
Summary	The Moray and Nairn Coast SPA is located on the south coast of the Moray Firth and comprises the intertidal flats, saltmarsh and sand dunes of Findhorn Bay and Culbin Bar, and the alluvial deposits and associated woodland of the Lower River Spey and Spey Bay. It is of outstanding nature conservation and scientific importance for coastal and riverine habitats and supports a range of wetland birds throughout the year. In summer it supports nesting osprey, whilst in winter it supports large numbers of Iceland/Greenland pink-footed goose, Icelandic greylag goose and other waterbirds, especially ducks, sea-ducks and waders. The geese feed away from the SPA on surrounding agricultural land during the day. The sea-ducks feed, loaf and roost over inundated intertidal areas within the site, but also away from the SPA in the open waters of the Moray Firth. Moray and Nairn Coast SPA forms an integral ecological component of the Moray Basin Firths and Bays, of which it is the easternmost unit.
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:** Osprey *Pandion haliaetus*, 7 pairs representing at least 7.0% of the breeding population in Great Britain (Count, as at early 1990s) [favourable maintained] **Over winter:** Bar-tailed godwit *Limosa lapponica*, 1,156 individuals representing at least 2.2% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) [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:** Greylag goose *Anser anser*, 2,679 individuals representing at least 2.7% of the wintering Iceland/UK/Ireland population (5 year peak mean 1991/2 - 1995/6) [favourable maintained] Pink-footed goose *Anser brachyrhynchus*, 139 individuals representing <0.1% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean 1991/2 - 1995/6) [unfavourable declining] Redshank *Tringa totanus*, 1,690 individuals representing at least 1.1% of the wintering Eastern Atlantic - wintering population (WeBS 1989-1993 and additional surveys) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance. **Over winter:** The area regularly supports 20,250 individual waterfowl including: pink-footed goose *Anser brachyrhynchus*, dunlin *Calidris alpina alpina*, oystercatcher *Haematopus ostralegus*, red-breasted merganser *Mergus serrator*, velvet scoter *Melanitta fusca*, common scoter *Melanitta nigra*, long-tailed duck *Clangula hyemalis*, wigeon *Anas penelope*, redshank *Tringa totanus*, greylag goose *Anser anser*, bar-tailed godwit *Limosa lapponica* [favourable maintained, except pink-footed goose: unfavourable declining]	
Conservation objectives:	
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 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: Troup, Pennan and Lion's Head SPA	
Location	Grid Ref: NH782677 (central point) Latitude 57º41'00"N Longitude 02º15'05"W
Area (ha)	3367.21
Summary	Troup, Pennan and Lion's head SPA is a 9km stretch of sea-cliffs along the Banff and Buchan coast of Aberdeenshire in north-east Scotland. As well as cliffs, the site also includes adjacent areas of grassland and heath, and several small sand or shingle beaches punctuate the otherwise rocky shore. The cliffs rise to 150m and provide ideal nesting sites for seabirds, which feed in the rich waters offshore and outside the SPA. Different parts of the cliffs are used by different species of seabirds according to varying ecological requirements. The site is particularly important for its numbers of gulls and auks.
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: **Over winter:** Guillemot *Uria aalge*, 29,902 pairs representing at least 1.3% of the breeding East Atlantic population (Count as at 1995) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance. During the breeding season, the area regularly supports 150,000 individual seabirds (Count, as at 1995) including: razorbill *Alca torda*, kittiwake *Rissa tridactyla*, herring gull *Larus argentatus*, fulmar *Fulmarus glacialis*, guillemot *Uria aalge* [favourable maintained, except herring gull and fulmar: 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: Loch of Strathbeg SPA	
Location	Grid Ref: NK070592 (central point) Latitude 57º 37' 24" N Longitude 01º 53' 00" W
Area (ha)	615.94
Summary	The Loch of Strathbeg is a shallow, naturally eutrophic loch with adjoining reedbeds, freshwater marshes, and alder and willow. The calcareous dunes and dune slacks within the site are relatively undisturbed and contain a rich flora. The loch constitutes the largest dune slack pool in the UK (200ha) and the largest waterbody in the northeast Scottish lowlands. It is separated from the sea by a 0.5-1km wide dune system. The SPA provides wintering habitat for a number of important wetland bird species, particularly wildfowl (swans, geese and ducks), and is also an important staging area for migratory wildfowl from Scandinavia and Iceland/Greenland. In summer, coastal parts of the site are an important breeding area for sandwich tern, which feed outside the SPA in adjacent 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:** Sandwich tern *Sterna sandvicensis*, 530 pairs representing up to 3.8% of the breeding population in Great Britain (5 year mean, 1993-1997) [unfavourable declining] **Over winter:** Barnacle goose *Branta leucopsis*, 226 individuals representing up to 1.9% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) [favourable maintained] Whooper swan *Cygnus cygnus*, 183 individuals representing up to 3.3% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6) [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:** Greylag goose *Anser anser*, 3,325 individuals representing up to 3.3% of the wintering Iceland/UK/Ireland population (winter peak means) [unfavourable declining] Pink-footed goose *Anser brachyrhynchus*, 39,924 individuals representing up to 17.7% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean 1991/2 - 1995/6) [favourable maintained]	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance. Over winter, the area regularly supports 49,452 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: teal *Anas crecca*, greylag goose *Anser anser*, pink-footed goose *Anser brachyrhynchus*, barnacle goose *Branta leucopsis*, whooper swan *Cygnus cygnus* [favourable maintained, except greylag goose: 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	

C2 Special Areas of Conservation

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 1 Habitat Primary feature: None Secondary features: None **Annex 2 Species** Primary features: Grey seal *Halichoerus grypus* [favourable maintained] Secondary features: None	
Conservation objectives:	
For Annex I Habitats N/A	
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)	10971.65
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 1 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 2 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: Moray Firth SAC	
Location	Grid Ref: NH976821 (central point) Latitude 57º49'00"N Longitude 03º43'36"W
Area (ha)	151341.67
Summary	The Moray Firth SAC is one of the largest marine SACs in the UK. The designated site lies west of a line between Helmsdale on the Sutherland coast and Lossiemouth on the Moray coast and includes the Beauly/Inverness Firths, and the outer reaches of the Dornoch and Cromarty Firths. The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea.

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

Annex 1 Habitat
Primary feature: None
Secondary features: Sandbanks which are slightly covered by sea water all the time [favourable maintained]

Annex 2 Species
Primary features: Bottlenose dolphin *Tursiops truncatus* [unfavourable recovering]
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 the qualifying interest.

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: Dornoch Firth and Morrich More SAC	
Location	Grid Ref: NH788863 (central point) Latitude 57º51'00"N Longitude 04º02'30"W
Area (ha)	8700.53
Summary	The Dornoch Firth is the most northerly complex estuary in the UK. Situated on the Scottish east coast, the estuary contains extensive areas of soft coastal features of international importance including saltmarshes, dunes and mudflats and sandflats. The area supports a good population of otters in what is the only east coast estuarine site selected for the species in Scotland. The estuary is also home to a significant proportion of the inner Moray Firth population of the harbour seal. Their numbers represent almost 2% of the UK population.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary features: Estuaries, mudflats and sandflats not covered by seawaters at low tide, *Salicornia* and other annuals colonising mud and sand [favourable maintained], Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [favourable maintained], embryonic shifting dunes [favourable maintained], shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') [favourable maintained], fixed dunes with herbaceous vegetation ('grey dunes') (*priority feature*) [unfavourable no change], decalcified fixed dunes with *Empetrum nigrum* (*priority feature*) [unfavourable no change], Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) (*priority feature*), humid dune slacks [favourable maintained], coastal dunes with *Juniperus* spp. (*priority feature*) [unfavourable no change] Secondary features: Sandbanks which are slightly covered by sea water all the time, reefs **Annex 2 Species** Primary features: Otter *Lutra lutra* [favourable maintained], harbour seal *Phoca vitulina* [unfavourable recovering] 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: Culbin Bar SAC	
Location	Grid Ref: NH940613 (central point) Latitude 57º37'45"N Longitude 03º46'30"W
Area (ha)	612.88
Summary	Culbin Bar is one of the two largest shingle sites in Scotland. It is 7km long and has a series of shingle ridges running parallel to the coast that support the best and richest examples of northern heath on shingle. Dominant species are heather, crowberry and juniper.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary feature: Perennial vegetation of stony banks [favourable maintained] Secondary features: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [unfavourable declining], embryonic shifting dunes [favourable maintained] **Annex 2 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	
For Annex II Species N/A	

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 two separate catchments, but share a short length of river just before they meet the sea. Both rivers are oligotrophic, draining the southern edge of the Caithness and Sutherland peatlands, and show only limited ecological variation along their length. Whilst they are comparatively small rivers and support only a small proportion of the Scottish salmon resource, their long history of low management intervention means that they score highly 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 1 Habitat Primary feature: None Secondary features: None **Annex 2 Species** Primary features: Atlantic salmon *Salmo salar* Secondary features: None	
Conservation objectives:	
For Annex I Habitats N/A	
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 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	

Site Name: River Oykel SAC	
Location	Grid Ref: NH494999 (central point) Latitude 57º58'20"N Longitude 04º44'00"W
Area (ha)	960.42
Summary	The Oykel is a long, meandering river in the northern Highlands of Scotland that flows into the Kyle of Sutherland on the east coast. The river supports an excellent, high-quality freshwater pearl mussel *Margaritifera margaritifera* population with high densities recorded at some locations, including a bed numbering several thousand individuals. Surveys have also recorded high percentages of juveniles within the population, indicating that there has been recent successful recruitment. There is also evidence of unsurveyed pearl mussel populations in deep water that may increase the conservation importance of the river.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary feature: None Secondary features: None **Annex 2 Species** Primary features: Freshwater pearl mussel Margaritifera margaritifera Secondary features: Atlantic salmon *Salmo salar*	
Conservation objectives:	
For Annex I Habitats N/A	
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 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 Moriston SAC	
Location	Grid Ref: NH297125 (central point) Latitude 57º10'20"N Longitude 04º49'00"W
Area (ha)	194.53
Summary	The River Moriston flows into the northern side of Loch Ness, and supports a functional freshwater pearl mussel *Margaritifera margaritifera* population. Pearl mussels are present from downstream of a hydro-electric dam to the confluence with Loch Ness. Due to illegal pearl-fishing the population is not abundant but survey results show that 40% of the population is composed of juveniles. This is the highest percentage recorded in any Scottish pearl mussel population and indicates that recent successful recruitment has taken place.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary feature: None Secondary features: None **Annex 2 Species** Primary features: Freshwater pearl mussel Margaritifera margaritifera Secondary features: Atlantic salmon *Salmo salar*	
Conservation objectives:	
For Annex I Habitats N/A	
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 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 Spey SAC	
Location	Grid Ref: NJ095319 (central point) Latitude 57º22'15"N Longitude 03º30'00"W
Area (ha)	5729.48
Summary	The River Spey is a large Scottish east coast river that drains an extensive upland catchment and supports an outstanding freshwater pearl mussel population in its middle to lower reaches. In parts of the River Spey, extremely dense mussel colonies have been recorded (225 m^2) and the total population is estimated at several million. As the population also shows evidence of recent recruitment and a high proportion of juveniles, the River Spey is considered to support a pearl mussel population of great international significance. The Spey supports one of the largest Atlantic salmon *Salmo salar* populations in Scotland, with little evidence of modification by non-native stocks. Adults spawn throughout virtually the whole length of the river, and good quality nursery habitat is found in abundance in the main river and numerous tributaries. Salmon in the Spey system are little affected by artificial barriers to migration, and the waters in the catchment are largely unpolluted (the river is oligotrophic throughout its length). For a system of its size, the Spey is also relatively free from flow modifications such as abstractions, diversions and impoundments. The salmon population includes fish of all ages including migrating smolts and returning adults, possibly reflecting genetic differences within the Spey stock. The River Spey represents the sea lamprey *Petromyzon marinus* in the northern part of its range in the UK. Recent surveys show that sea lamprey larvae are widely distributed throughout the middle and lower reaches of the river, where the particularly fast-flowing waters of the River Spey provide ideal spawning conditions for this species. In addition, as an unpolluted and relatively little modified system, the River Spey matches the other key habitat requirements of the sea lamprey in terms of good water quality, clean gravels and marginal silts and an unhindered migration route to the sea. The Spey represents an important otter *Lutra lutra* site in Scotland, with good quality freshwater habitat. Surveys have identified high levels of otter presence throughout the Spey catchment. Riverine habitat features which are known to be important to otters are present, such as reedbeds and islands, and populations of important prey species are relatively healthy. The persistence of a strong population of otter on this river indicates that habitat conditions are particularly favourable for the survival of the species.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary feature: None Secondary features: None **Annex 2 Species** Primary features: Freshwater pearl mussel Margaritifera margaritifera, Sea lamprey Petromyzon marinus, Atlantic salmon *Salmo salar, Otter Lutra lutra* Secondary features: None	
Conservation objectives:	
For Annex I Habitats N/A	
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 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	

Site Name: River Spey SAC
• Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species

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URN 11D/906