

## 10 CONSIDERATION OF EFFECTS OF LICENSING IN AREAS COVERED BY PREVIOUS DTI SEAS

### 10.1 Introduction

As described in Section 3, offshore licensing for oil and gas exploration and production has proceeded in a series of licensing rounds since 1965. Over time, a number of blocks or part blocks have been relinquished by the operator and therefore become available for re-offer for licensing. Since 2002 the DTI has introduced an active process to encourage relinquishment of "fallow" blocks so that their potential may be explored or developed by others. Fallow blocks are currently defined as those where the initial term of the licence has expired and there has been no drilling for a period of 4 years, and there has been no dedicated seismic or other significant activity in the last 2 years. Some fallow blocks contain hydrocarbon discoveries, which for a variety of reasons have not been developed. Since the fallow acreage process began in 2002, 31 exploration or appraisal wells have been drilled resulting in the development of 3 small fields, 3 discoveries and 2 successful appraisals. In addition, since 2002, 11 new proprietary seismic surveys have been carried out in fallow blocks ([http://www.og.dti.gov.uk/UKpromote/fallow\\_assets.htm](http://www.og.dti.gov.uk/UKpromote/fallow_assets.htm)).

In the licence rounds that followed SEA 3, SEA 4 and SEA 5, in addition to the blocks covered by the respective SEA, the DTI offered for licensing unlicensed blocks in areas previously subject to SEA. These unlicensed blocks in the area included those blocks for which licences were not applied for in the previous round and those which had been relinquished in the intervening period.

The issue of how to assess within a SEA the implications of the re-offer of blocks in previously SEAed areas was discussed at a previous Assessment Workshop (SEA 5) in 2004. It was concluded that the reoffer of blocks needed to be addressed on a case by case basis taking due account of:

- The previous activity scenarios used in the original SEA and the scale of subsequent activity in the area
- Changes in environmental regulations
- New information on the environment of the area
- Changes in understanding of environmental effects from potential activities
- New pollution control techniques and technology

It was also agreed that the reoffer of blocks should be an agenda item for future SEA Expert Assessment Workshops.

This process has also been followed for the SEA 6 consideration of the reoffer of blocks.

The 24<sup>th</sup> licensing round planned to follow SEA 6, could include unlicensed blocks within the SEA 1, SEA 2, SEA 3, SEA 4 and SEA 5 areas and a consideration for each area is given below. To reduce the need for cross referencing between the original SEA documents and this environmental report, a summary of the environment and uses, key new information sources, and then and now licensing status schematics are provided for each SEA area. These are followed by a discussion of potential licensing of blocks in previous SEA areas.

## 10.2 Summary of SEA areas and relevant new information

### 10.2.1 SEA 1

#### SEA 1 Overview

The overall topography of the SEA 1 area is dominated by a number of large-scale features; the deep water Faroe-Shetland and Faroe Bank Channels and the Wyville Thomson Ridge rising to within 400m of the water surface and dividing the Faroe Bank Channel from the Rockall Trough to the south. Numerous small to medium scale seabed features are also present resulting from past volcanic and glacial activity as well as modern sediment erosion, transport and deposition. Seabed sediments in the area vary with depth, with sediments in the deeper areas usually consisting of mud or muddy sand, and the proportion of mud decreasing upslope to the continental shelf break where the sediments are predominantly sands and gravel. Contaminant concentrations in sediments and seawater in the area are low and generally at, or close to, background levels.

The area has a complex hydrographic regime, with distinct water masses resulting in a pronounced difference in temperature between shallow and deeper waters. The main surface and slope currents flow northwards across the Wyville Thomson Ridge in water depths to around 500m, with a deeper southwesterly flowing cold current deflected westwards along the Faroe Bank Channel. Large scale atmospheric systems in the North Atlantic can induce significant variability to water mass characteristics and water flow patterns.

The topography and associated hydrographic conditions are strong determinants of the ecological character of the SEA 1 area. Phytoplankton productivity in the area varies seasonally. In the North Atlantic, the spring diatom bloom generally peaks in May with a sharp decline in June. Zooplankton communities are dominated by the copepod *Calanus finmarchicus* which represents an important food source for the young of many fish species and is important in the recruitment of fish stocks of the area. The Faroe-Shetland Channel is an important over-wintering area for *C. finmarchicus* which are transported into the North Sea in spring. Seabed communities in the area are characteristic of the interface of several biogeographic zones although they are widely distributed across the region. Water temperature and bathymetry are the primary environmental influences on distribution patterns in both community and species composition.

The Darwin Mounds on the southern flank of the Wyville Thomson Ridge were first discovered in 1998 and appear to be unique geological and biological features. The mound tails appear to have no physical expression, but are inhabited by dense populations of xenophyophores (single celled animals of up to 10cm diameter). The central mound appears to consist of blocky rubble with the cold water coral *Lophelia pertusa* usually present. The ecological significance of the mounds is unclear, although both *Lophelia* and xenophyophores are widely distributed elsewhere in the region. Following the introduction of enabling legislation, the mounds will be put forward as the UK's first offshore Special Area of Conservation (SAC) under the EU Habitats Directive. An area of Annex I reef habitat on the Wyville Thomson Ridge has also been proposed as an offshore SAC.

The SEA 1 area has no coastline, although in adjacent SEA areas 4 and 7, islands and coasts all have important conservation sites on international, European and national scales. Designated conservation sites include World Heritage Sites (St Kilda and parts of Orkney), Biosphere Reserves, Special Protection Areas (SPAs), Special Areas of Conservation (SACs), and Ramsar sites. These have variously been designated for importance in relation

to breeding seabirds, wildfowl and moorland birds, seals, otters, vegetated sea cliffs, submerged caves, reefs, lagoons and archaeology.

Seabird populations within the SEA 1 area consist mainly of breeding birds (fulmars, storm petrels, gannets, kittiwakes and various auks) from major colonies in the Faroe, Shetland, and Orkney Islands and more northerly breeding areas such as Norway and Iceland. In addition, a number of species migrate through the area in late summer and autumn (skuas and shearwaters), or are winter visitors (some gulls and little auk). The region to the north and west of Scotland contains substantial proportions of the northeast Atlantic breeding populations of some species, in particular great skua, gannet, puffin and black guillemot.

In a UK and North Atlantic context, the area is of high importance for marine mammal populations. Cetaceans in the area and adjacent waters can be broadly distinguished into several groups, on the basis of distribution and feeding:

- Baleen whales (blue, fin, sei and humpback) are mainly recorded in deep water
- Minke whales are summer visitors to shelf areas
- Sperm and beaked whales are concentrated on the eastern flank of Rockall Trough, the southern flank of Wyville Thomson Ridge and along the eastern side of the Faroe-Shetland Channel
- Atlantic white-sided and common dolphins are widely distributed in deep water
- White-beaked and Risso's dolphins are concentrated in shelf waters
- Killer whale, bottlenose dolphin and harbour porpoise are all widely distributed over deep and shelf waters.

Shetland and Orkney support large numbers of grey and common seals which breed on the islands and forage in coastal and offshore waters. Recent tagging data suggests that these animals forage more widely than previously thought, although numbers in the SEA 1 area are likely to be small as sightings over deep water are rare. Hooded seals utilise deep water in the Faroe-Shetland Channel and north of the Faroes, throughout the year.

The cold Norwegian Sea water of the deep Faroe-Shetland and Faroe Bank Channels supports a sparse and distinct fish fauna, of little commercial value, with very few of the Atlantic deep water species which are found on the upper slopes of the Faroe-Shetland Channel being present. The Wyville Thomson Ridge appears to form a major faunal barrier to deeper water fish.

The main commercial pelagic species found in the area are mackerel, Norway pout and blue whiting. Herring may also occur in the area and greater silver smelt is also present. Other than the greater silver smelt, commercial pelagic species are generally concentrated over the continental shelf and shelf break to the east. Deep-water vessels from Scotland, France, Spain and Norway dominate fishing in the area, with fishing vessels from England, Faroe, Germany, Netherlands, Denmark and Ireland also present. The main demersal gears employed are otter trawls and long-lines, with some gill netting also being used. Demersal fishing effort in the area is relatively low compared to other UK waters with greatest effort being seen around the Wyville Thomson Ridge. Pelagic effort over the upper slope is at similar levels to that seen in other areas around the UK.

Within the SEA 1 area, a significant oil and gas discovery was made in 2004 at the Rosebank/Lochnagar well (Block 213/27) with further appraisal of the discovery currently ongoing. The recent licence awards as part of the second Faroese licensing round may result in increased exploration activities in adjacent Faroese waters. The waters of the SEA 1 area are of minor importance for shipping. Coastal industry and activities in adjacent

areas (the Faroe, Shetland, Orkney and Western Isles and northwest Scotland) include fishing, aquaculture, tourism and recreation. All are of considerable importance to local economies.

## SEA Context and New Information for SEA 1 Area

Aspect	Implications for SEA	Post SEA Information Sources
<b>Geology &amp; substrates</b>	Biodegradation & accumulation of contaminants Range of benthic habitats present Physical disturbance.	1. Sub-seabed Geology <sup>1</sup> 2. Continental Shelf Seabed Geology and Processes <sup>1</sup> 3 Geological Evolution Pilot Whale Diapirs and Stability of the Seabed Habitat <sup>1</sup> 4. Seafloor Sediments and Sedimentary Processes on the Outer Continental Shelf, Continental Slope and Basin Floor <sup>1</sup>
<b>Climate &amp; Meteorology</b>	Oil spill trajectory. Atmospheric dispersion.	-
<b>General bathymetry</b>	Dispersion of discharges. Seabed features of potential conservation interest.	Geological Evolution Pilot Whale Diapirs and Stability of the Seabed Habitat <sup>1</sup>
<b>Water masses</b>	Pattern of discharge dispersion. Rate of degradation of organic material. Spilled oil behaviour.	-
<b>Water currents &amp; waves</b>	Spilled oil behaviour & response options. Particulate dispersion & re-dispersion.	-
<b>Existing contamination</b>	Discharge quality criteria.	1. Review of the Analysis of Oil Residues Collected for the Atlantic Frontier Environmental Network January 1996 to February 2003 ERT Data Report 885 July 2003 2. Analyses of sediment samples taken during SEA 4 survey. ERT Data Report 3. Coastal baseline – Exposure and effects of PAH in the coastal zone around the Faroe Islands (Food and Environmental Agency 2004) <sup>2</sup>
<b>Plankton</b>	Vulnerability to spills. Pelagic-benthic system coupling, rapid transfer of material to seabed.	1. Plankton Report for Strategic Environmental Assessment Area 4 <sup>1</sup> 2. Macrozooplankton in the Faroe-Shetland Channel (Faroese Fisheries Laboratory 2003) <sup>2</sup>
<b>Benthos</b>	Vulnerable faunal community or species. Rate of recovery. Contaminant transfer into food web. Smothering & changed sediment type.	1. Synthesis of Information on the Shallow Benthos of the SEA 4 Area <sup>1</sup> 2. An Overview of Benthic Ecology of the Faroe-Shetland Channel <sup>1</sup> 3. Expert review of seabed fauna and chemistry (Bett <i>et al.</i> 2001) <sup>2</sup> 4. Environmental baseline survey of the Faroe offshore licence areas 001 – 004 in the Faroe – Shetland Channel (Akvaplan-NIVA 2002)
<b>Cephalopods</b>	Possible vulnerability to drilling & operational discharges or spills.	An Overview of Cephalopods Relevant to the SEA 4 Area <sup>1</sup>

Aspect	Implications for SEA	Post SEA Information Sources
<b>Fish</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	<ol style="list-style-type: none"> <li>1. Fish and Fisheries in the SEA 4 Area<sup>1</sup></li> <li>2. An experiment on how seismic shooting affects caged fish (Thomsen 2002)<sup>2</sup>.</li> <li>3. A baseline study of Greenland halibut off the Faroe Islands (Grøsvik <i>et al.</i> 2000)<sup>2</sup></li> </ol>
<b>Marine reptiles</b>	Possible vulnerability to drilling & operational discharges or spills.	<ol style="list-style-type: none"> <li>1. JNCC report on bycatch of marine turtles (Pierpoint 2000) - Report provides information from a database of turtle sightings in UK waters.</li> <li>2. UK &amp; Eire marine turtle strandings &amp; sightings annual reports (Penrose 2002, 2003, 2004, 2005).</li> </ol>
<b>Seabirds</b>	Vulnerability to oil spills.	<ol style="list-style-type: none"> <li>1. Seabird populations of Britain &amp; Ireland. Mitchell <i>et al.</i> (2004). - Published results of Seabird 2000. The most recent &amp; comprehensive study of the 25 species of seabird which breed in Britain &amp; Ireland.</li> <li>2. The distribution of seabirds and cetaceans around the Faroe Islands (JNCC 2001)<sup>2</sup></li> </ol>
<b>Seals</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	<ol style="list-style-type: none"> <li>1. Background Information on Marine Mammals Relevant to Strategic Assessment 4<sup>1</sup></li> <li>2. SMRU seal tagging studies indicate seals forage more widely than previously thought.</li> </ol>
<b>Cetaceans</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	<ol style="list-style-type: none"> <li>1. Background Information on Marine Mammals Relevant to Strategic Assessment 4<sup>1</sup></li> <li>2. JNCC Atlas of cetacean distribution in north-west European waters (Reid <i>et al.</i> 2003).</li> <li>3. Underwater ambient noise. SEA 6 Technical report (Harland <i>et al.</i> 2005)<sup>1</sup>.</li> <li>4. The distribution of seabirds and cetaceans around the Faroe Islands (JNCC 2001)<sup>2</sup>.</li> <li>5. SCANS (Small Cetacean Abundance in the North Sea) survey currently in progress.</li> </ol>

Aspect	Implications for SEA	Post SEA Information Sources
<b>Potential offshore conservation sites</b>	Potential disturbance by seismic noise. Vulnerability to oil spills	<ol style="list-style-type: none"> <li>1. JNCC 03 P01 paper – Marine Natura 2000 (Johnston <i>et al.</i> 2003).</li> <li>2. JNCC 04 P23 paper - Progress in identifying SACs for Annex I habitats, including proposals for four offshore habitat SACs (Johnston <i>et al.</i> 2004a).</li> <li>3. JNCC 04 P05 paper - Update on progress in marine Natura (Johnston <i>et al.</i> 2004b).</li> <li>4. JNCC 04 N08 paper – Developing the concept of an ecologically coherent network of OSPAR Marine Protected Areas (JNCC 2004).</li> <li>5. JNCC 05 P10 paper (Turnbull <i>et al.</i> 2005)</li> <li>6. The Darwin Mounds on the Wyville Thomson Ridge were noted in SEA 1 as requiring special consideration. The mounds are a cSAC and have been afforded protection under Council Regulation (EC) No 602/2004 of 22 March 2004 amending Regulation (EC) No 850/98 as regards the protection of deepwater coral reefs from the effects of trawling in an area north west of Scotland which entered into force on 23 August 2004.</li> </ol>
<b>Existing human activities</b>	Interference with other users of the marine environment. Potential for cumulative effects.	<ol style="list-style-type: none"> <li>1. Existing Users and Management Initiatives Relevant to SEA 4<sup>1</sup></li> <li>2. The Potential Socio-Economic Implications of Licensing the SEA 4 Area<sup>1</sup></li> <li>3. Fishing data for the Faroes (DNV 2005)<sup>2</sup></li> </ol>
<b>Coastal sensitivities</b>	Vulnerability to oil spills.	<ol style="list-style-type: none"> <li>1. SNH and JNCC websites -provide up-to-date, detailed information on conservation sites.</li> <li>2. Coastal Conservation Sites in the SEA 4 Area<sup>1</sup></li> <li>3. Faroe Islands coastal resources and prioritisation maps (The Food, Veterinary and Environmental Agency 2003)<sup>2</sup></li> </ol>
<b>Cultural Heritage</b>	Potential to damage sites during drilling or construction. Opportunity to discovery previously unrecognised sites.	The Scope of Strategic Environmental Assessment of Continental Shelf Area SEA 4 in Regard to Prehistoric Archaeological Remains <sup>1</sup>

## Notes:

1. All SEA Technical Reports and Consultation Documents are available on the DTI SEA website ([www.offshore-sea.org.uk](http://www.offshore-sea.org.uk)).
2. All reports available on the Faroese Oil Industry Group (FOiB) website (<http://www.foib.fo/FoibPortal/DesktopDefault.aspx?tabid=113>).

## 10.2.2 SEA 2

### SEA 2 Overview

The SEA 2 area covers a large part of the southern, central and northern North Sea and contains the majority of the UK's oil and gas producing fields. Water depths gradually deepen from south to north and the main topographic features are the Dogger Bank which divides the southern and central North Sea, the Fladen/Witch Ground, a large muddy

depression between the central and northern North Sea, and the Norwegian Trench, a deep water channel to the east of the northern SEA 2 area.

Various inflows of Atlantic water into the North Sea occur from the west and north, with outflow mainly via the Norwegian Trough and along the Norwegian coast. Water circulation in the North Sea is anticlockwise, with an eddy forming over the Fladen Ground. The water column of the southern North Sea remains mixed throughout the year while to the north it becomes stratified in summer, effectively isolating surface and near bottom waters until autumn gales break down the stratification.

Seabed sediments over the majority of the area are sand or mud, or a mixture of the two. Typically, sandier sediments are found in the south and north, and in coastal waters, with muddy sediments present in the deeper areas of the central North Sea. Pockmarks (shallow seabed depressions formed from the seepage of gas) are found in muddy areas in particular the Fladen and Witch Grounds. Most pockmarks are relict features but a few continue to leak natural gas and some contain carbonate rocks which provide a habitat for encrusting and other surface living seabed animals.

The DTI commissioned survey for SEA 2 investigated habitats of potential conservation interest within the area. These covered potential areas of Annex I habitats defined by the EU Habitats Directive as *sandbanks in shallow water* and *submarine structures made by leaking gases*. Since SEA 2, the Dogger Bank has been proposed as an offshore SAC for the qualifying feature *sandbanks which are slightly covered by sea water all the time*. Other relevant sites that have been proposed as offshore SACs include the ‘Saturn’ *Sabellaria spinulosa* reef site between Swarte and Broken Banks in the southern North Sea and the Scanner pockmark in the Witch Ground. Relevant areas of Annex I habitat that may be designated in the near future include the Braemar pockmarks; the North Norfolk Sandbanks; Haddock Bank; Haisborough Tail, Hewett Ridges, Hammond Knoll & Smiths Knoll.

The North Sea is a very productive area with a “food web” linking the plankton (the source of much of the initial productivity) with fish, birds, marine mammals, other water column animals and the fauna of the seabed.

Recently, phytoplankton biomass has increased in the SEA 2 area possibly associated with large scale meteorological and hydrographical variations. The zooplankton community has also shown significant changes particularly in the proportions of the dominant copepod species, which have been linked to increasing sea surface temperatures. The ecological importance of these changes to the plankton community has yet to be fully understood. Benthic communities are also determined broadly by hydrographic conditions with water temperature particularly important. On a smaller scale, community types reflect local sediment distribution patterns.

Offshore areas of the North Sea including the SEA 2 area contain peak numbers of seabirds following the breeding season and through winter, with birds tending to forage closer to coastal breeding colonies in spring and early summer. Many shorebirds and waterfowl also use North Sea coastal waters and shores extensively, particularly during spring and autumn migrations and some species overwinter in large numbers.

A wide range of cetaceans are sighted in the North Sea, the most common being the harbour porpoise, minke whale and white beaked dolphin. Bottlenose dolphins from the nearshore population of the Moray Firth are rarely seen far offshore. Important grey and common seal breeding colonies on the UK east coast have been protected through designation as Special Areas of Conservation. Recent tagging studies indicate that both species forage extensively in nearshore and offshore areas of the North Sea.



The North Sea coastline has many sites of conservation, economic and human interest. A large number of coastal sites have been protected at a European level under the EU Habitats and Birds Directives. Important archaeological sites dating back to prehistoric times have been found in coastal areas surrounding the North Sea with significant offshore sites likely although few have yet been discovered.

Fish species diversity in the SEA 2 area is higher in the central and northern North Sea and in inshore waters. The North Sea is one of the world's most important fishing grounds with extensive fisheries for pelagic species (e.g. herring and mackerel) demersal species (cod, haddock and whiting in the central and northern North Sea, with plaice and sole targeted in the south). In addition there are important shellfisheries for Norway lobster, crab and scallop and industrial fisheries for sandeel and Norway pout. Commercial fishing in the area is of significant importance for both the UK and other North Sea states.

The oil and gas fields of the SEA 2 area have formed the focus of much of the UK offshore industry over the last 30 years. Recent high oil prices have led to an upturn in activity in the central North Sea with the number of exploration, appraisal and development wells drilled in the region increasing since 2003. Shipping is another major user of offshore areas of the North Sea, particularly in southern parts with the large ports on the UK east coast forming an important focus for many of the shipping routes.

Contamination concentrations are typically very low but in some (usually coastal) areas they can be high enough to result in marked biological effects (e.g. through eutrophication). The historic discharge of oil based drill muds with rock cuttings from oil and gas well drilling has resulted in numerous piles of cuttings on the seabed in the northern and central SEA 2 areas. Produced water from existing oil industry activities remains a source of contaminants although company, national and OSPAR actions have succeeded in reducing the average concentration of oil in these discharges.

## SEA Context and new information for SEA 2 area

Summary	Implications for SEA	Post SEA Information Sources
<b>Geology &amp; substrates</b>	Biodegradation & accumulation of contaminants. Range of benthic habitats present. Physical disturbance, creating mounds or scars.	1. North Sea Geology - updated BGS report for SEA 3 <sup>1</sup> . 2. Sand banks, sand transport and offshore wind farms (Kenyon & Cooper 2005) <sup>1</sup> .
<b>Climate &amp; Meteorology</b>	Oil spill trajectory. Atmospheric dispersion.	-
<b>General bathymetry</b>	Dispersion of discharges. Seabed features of potential conservation interest.	-
<b>Water masses</b>	Pattern of discharge dispersion. Rate of degradation of organic material. Spilled oil behaviour.	-
<b>Water currents and waves</b>	Spilled oil behaviour & response options. Particulate dispersion & re-dispersion.	-



Summary	Implications for SEA	Post SEA Information Sources
<b>Existing contamination</b>	Discharge quality criteria.	<ol style="list-style-type: none"> <li>1. Russell <i>et al.</i> (2003) poster on changes in Fladen Ground sediment hydrocarbon composition and concentration between 1989 and 2001.</li> <li>2. Second phase reports of the UKOOA/OLF drill cuttings research and development programme<sup>2</sup></li> <li>3. Risk assessment of reproductive effects of alkyl phenols in produced water on fish stocks in the North Sea (OLF 2005)<sup>3</sup></li> <li>4. Cutting piles – Area contaminated with THC (DNV 2004)<sup>3</sup></li> <li>5. Biomarker measurements – produced water components (OLF 2001)<sup>3</sup></li> <li>6. Contaminant sampling of the Fladen Ground by FRS (reported 2002 and 2005) has indicated that hydrocarbon concentrations in sediments have declined significantly in recent years.</li> </ol>
<b>Plankton</b>	Vulnerability to spills. Pelagic-benthic system coupling, rapid transfer of material to seabed.	Overview of plankton ecology in the North Sea Addendum to SEA 2 <sup>1</sup>
<b>Benthos</b>	Vulnerable faunal community or species. Rate of recovery. Contaminant transfer into food web. Smothering & changed sediment type.	<ol style="list-style-type: none"> <li>1. Callaway <i>et al.</i> (2002). Paper on diversity and community structure of epibenthic invertebrates and fish in the North Sea.</li> <li>2. Hiscock <i>et al.</i> (2002). Environmental screening for marine habitats &amp; species for R2 wind licensing.</li> </ol>
<b>Cephalopods</b>	Possible vulnerability to drilling & operational discharges & spills.	Overview of Cephalopods relevant to the SEA 2 and SEA 3 Areas <sup>1</sup> - updated Aberdeen University report for SEA 3
<b>Fish</b>	Possible vulnerability to drilling & operational discharges & spills. Timing of seismic surveys.	<ol style="list-style-type: none"> <li>1. Prime Minister's Strategy Unit (2004) report "Net Benefits, a sustainable and profitable future for UK fishing"</li> <li>2. Royal Society of Edinburgh (2004) "Inquiry into the Future of the Scottish Fishing Industry"</li> </ol>
<b>Marine reptiles</b>	Possible vulnerability to drilling & operational discharges & spills. Timing of seismic surveys.	<ol style="list-style-type: none"> <li>1. JNCC report on bycatch of marine turtles (Pierpoint 2000) - Report provides information from a database of turtle sightings in UK waters.</li> <li>2. UK &amp; Eire marine turtle strandings &amp; sightings annual reports (Penrose 2002, 2003, 2004, 2005).</li> </ol>
<b>Seabirds (&amp; coastal birds)</b>	Vulnerability to oil spills.	<ol style="list-style-type: none"> <li>1. Seabird populations of Britain &amp; Ireland. Mitchell <i>et al.</i> (2004). - Published results of Seabird 2000. The most recent &amp; comprehensive study of the 25 species of seabird which breed in Britain &amp; Ireland.</li> <li>2. JNCC report 333 – aerial surveys of UK inshore waters for wintering seaducks, divers &amp; grebes (Dean <i>et al.</i> 2003).</li> <li>3. JNCC report 329 - Seabird use of waters adjacent to colonies (McSorley <i>et al.</i> 2003).</li> </ol>

Summary	Implications for SEA	Post SEA Information Sources
<b>Seals</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. SMRU report on marine mammals relevant to SEA 2 & SEA 3 <sup>1</sup> . -Seal tagging studies indicate seals forage more widely than previously thought.
<b>Cetaceans</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. Marine mammals in the North Sea - SMRU report updated for SEA 3 <sup>1</sup> . 2. JNCC Atlas of cetacean distribution in north-west European waters (Reid <i>et al.</i> 2003). 3. Underwater ambient noise. SEA 6 Technical report (Harland <i>et al.</i> 2005) <sup>1</sup> . 4. SCANS 2 survey currently in progress.
<b>Potential offshore conservation sites</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. Conservation Sites in the SEA 3 Area <sup>1</sup> 2. JNCC 03 P01 paper – Marine Natura 2000 (Johnston <i>et al.</i> 2003). 3. JNCC 04 P23 paper - Progress in identifying SACs for Annex I habitats, including proposals for four offshore habitat SACs (Johnston <i>et al.</i> 2004a). 4. JNCC 04 P05 paper - Update on progress in marine Natura (Johnston <i>et al.</i> 2004b). 5. JNCC 04 N08 paper – Developing the concept of an ecologically coherent network of OSPAR Marine Protected Areas (JNCC 2004) 6. JNCC 05 P10 paper (Turnbull <i>et al.</i> 2005) 7. BGS completed a study of the origin of shallow gas in Blocks 15/20c and 15/25d which are currently restricted for licensing as a result of the SEA process.
<b>Existing human activities</b>	Interference with other users of the marine environment.	1. Human activities in the SEA 3 Area <sup>1</sup> 2. The Potential Socio-Economic Implications of Licensing the SEA 3 Area <sup>1</sup> 3. Coastal Initiatives and Management Plans in the SEA 3 Area <sup>1</sup>
<b>Coastal sensitivities</b>	Vulnerability to oil spills.	1. Conservation Sites in the SEA 3 Area <sup>1</sup> 2. SNH, EN and JNCC websites - provide up-to-date, detailed information on conservation sites. 3. Other Designated Sites in the SEA 3 Area <sup>1</sup> 4. JNCC Marine Natura 2000 consultation: The use of generic guidance for extending existing SPAs for breeding seabirds (2004).
<b>Cultural Heritage</b>	Potential to damage to sites during drilling or construction. Opportunity to discovery previously unrecognised sites.	The scope of Strategic Environmental Assessment of North Sea areas SEA 3 and SEA 2 in regard to prehistoric archaeological remains <sup>1</sup>

## Notes:

1. All SEA Technical Reports and Consultation Documents are available on the DTI SEA website ([www.offshore-sea.org.uk](http://www.offshore-sea.org.uk)).
2. Reports available on UKOOA website (<http://www.ukooa.co.uk/>).
3. Reports available on the OLF website ([www.olf.no](http://www.olf.no)).

### 10.2.3 SEA 3

#### SEA 3 overview

The SEA 3 area covers a large part of the central and southern North Sea and includes the entire coast of eastern England. Water depth gradually deepens from south to north with the Dogger Bank, the main topographic feature of the region. Water circulation consists of a southerly coastal flow which in the southern part moves offshore across the North Sea. There is a relatively minor inflow of water into the area through the English Channel.

Seabed sediments in SEA 3 are generally sandy and gravelly in the south and in coastal waters. Large sandbanks of variable morphology and sediment composition are present in both coastal and offshore waters. Rocky outcrops and platforms are associated with discrete sections of the coast, primarily in the northern part of the area. Several large estuaries including the Thames estuary and Wash embayment are also present. Many of these coastal habitats support a diverse range of benthic species as well as internationally important numbers of seabirds, waterbirds and marine mammals which are protected at national and international levels. Further offshore, the DTI survey of the SEA 2 and adjacent areas highlighted the species richness of certain types of sandbank. As mentioned in the SEA 2 overview, the Dogger Bank has been proposed as an offshore SAC and a number of sandbanks are likely to be proposed as SACs (some of which may extend into the SEA 3 area) in the near future.

The SEA 3 area supports a wide variety of fish species although in general, diversity is highest in the central and northern North Sea and in inshore waters. Coastal waters of SEA 3 support important fixed gear fisheries for crab, lobster, whelk, and cockles as well as netting for a number of fish species, including cod, herring and sole. Salmon netting off the North East coast has declined significantly due to a recent buy-out of fishing licences. Further offshore, a mixed demersal fishery primarily targets cod, whiting, plaice and sole. Herring are taken from northwest of the Dogger Bank and in the coastal waters of eastern England. An industrial sandeel fishery targets the Dogger Bank as well as coastal and offshore areas of the northern part of the SEA 3 area.

Sandeels represent an important prey species for a number of seabird species, many of which utilise internationally important seabird breeding colonies along the SEA 3 coast in the spring and early summer. Offshore areas of SEA 3 contain peak numbers of seabirds following the breeding season and throughout the winter. Many of the estuaries along the English east coast also support important populations of migratory and wintering wildfowl and waders, as well as breeding birds. Many of the coastal sites of international importance for seabirds and waterbirds have been protected through various designations at national, European and international levels.

The SEA 3 area is of less overall importance to cetaceans compared to more northerly parts of the North Sea, although some areas are important for harbour porpoise and white-beaked dolphin. The SEA 3 coast, particularly around the Farne Islands and the Wash, supports internationally important (and protected) grey and common seal breeding sites and both species forage extensively in nearshore and offshore areas.

Prehistoric sites discovered within the SEA 3 area are important but probably represent a small fraction of existing sites. Important coastal sites have been discovered along the coasts of Cleveland, Yorkshire, Norfolk, Essex and Kent. Offshore archaeological discoveries have been made on the Dogger Bank, the Leman and Ower Banks and the

Brown Ridge in the southern North Sea. There are also a number of historic wrecks and protected monuments in coastal waters of the southern SEA 3 area.

The SEA 3 marine environment provides an important resource for a wide variety of users. The extensive natural gas reservoirs of the southern North Sea have attracted significant infrastructure development and a number of oil and gas pipelines traverse the SEA 3 area. The greater Wash area and the Thames estuary are the focus of considerable development in offshore wind farms with large areas licensed recently for development. The Scroby Sands windfarm off Great Yarmouth is now operational. The presence of offshore sand and gravel deposits in coastal waters provides an important source of marine aggregates and, within the same area there are a number of marine disposal sites for spoil from harbour and other dredging operations.

### SEA context and new information for SEA 3 area

Summary	Implications for SEA	Post SEA Information Sources
<b>Geology &amp; substrates</b>	Biodegradation & accumulation of contaminants. Range of benthic habitats present. Physical disturbance, creating mounds or scars.	1. Southern North Sea Sediment Transport Study Phase 2 report and outputs. 2. Sand banks, sand transport and offshore wind farms (Kenyon & Cooper 2005) <sup>1</sup> .
<b>Climate &amp; Meteorology</b>	Oil spill trajectory. Atmospheric dispersion.	-
<b>General bathymetry</b>	Dispersion of discharges. Seabed features of potential conservation interest.	-
<b>Water masses</b>	Pattern of discharge dispersion. Rate of degradation of organic material. Spilled oil behaviour.	-
<b>Water currents and waves</b>	Spilled oil behaviour & response options. Particulate dispersion & re-dispersion.	-
<b>Existing contamination</b>	Discharge quality criteria.	Risk assessment of reproductive effects of alkyl phenols in produced water on fish stocks in the North Sea (OLF 2005) <sup>2</sup> .
<b>Plankton</b>	Vulnerability to spills. Pelagic-benthic system coupling, rapid transfer of material to seabed.	-
<b>Benthos</b>	Vulnerable faunal community or species. Rate of recovery. Contaminant transfer into food web. Smothering & changed sediment type.	1. Callaway <i>et al.</i> (2002). Paper on diversity and community structure of epibenthic invertebrates and fish in the North Sea. 2. Hiscock <i>et al.</i> (2002). Environmental screening for marine habitats & species for R2 wind licensing.
<b>Cephalopods</b>	Possible vulnerability to drilling & operational discharges & spills.	-
<b>Fish</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	Prime Minister's Strategy Unit (2004) report "Net Benefits, a sustainable and profitable future for UK fishing"
<b>Marine reptiles</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	UK & Eire marine turtle strandings & sightings annual reports (Penrose 2003, 2004, 2005).

Summary	Implications for SEA	Post SEA Information Sources
<b>Seabirds (&amp; coastal birds)</b>	Vulnerability to oil spills.	<p>1. Seabird populations of Britain &amp; Ireland. Mitchell <i>et al</i> (2004). - Published results of Seabird 2000. The most recent &amp; comprehensive study of the 25 species of seabird which breed in Britain &amp; Ireland.</p> <p>2. JNCC report 333 – aerial surveys of UK inshore waters for wintering seaducks, divers &amp; grebes (Dean <i>et al.</i> 2003).</p> <p>3. JNCC report 329 - Seabird use of waters adjacent to colonies (McSorley <i>et al.</i> 2003).</p> <p>4. Round 2 windfarm collaborative aerial surveys of bird distribution (WWT)</p>
<b>Seals</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	Early results from SMRU satellite tagging on harbour seals in the Wash
<b>Cetaceans</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	<p>1. JNCC Atlas of cetacean distribution in north-west European waters (Reid <i>et al.</i> 2003).</p> <p>2. Underwater ambient noise. SEA 6 Technical report (Harland <i>et al.</i> 2005)<sup>1</sup>.</p> <p>3. SCANS 2 survey currently in progress.</p>
<b>Potential offshore conservation sites</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	<p>1. JNCC report – Natura 2000 in UK offshore waters (Johnston <i>et al.</i> 2002).</p> <p>2. JNCC 03 P01 paper – Marine Natura 2000 (Johnston <i>et al.</i> 2003).</p> <p>3. JNCC 04 P23 paper - Progress in identifying SACs for Annex I habitats, including proposals for four offshore habitat SACs (Johnston <i>et al.</i> 2004a).</p> <p>4. JNCC 04 P05 paper - Update on progress in marine Natura (Johnston <i>et al.</i> 2004b).</p> <p>5. JNCC 04 N08 paper – Developing the concept of an ecologically coherent network of OSPAR Marine Protected Areas (JNCC 2004)</p> <p>6. JNCC 05 P10 paper (Turnbull <i>et al</i> 2005).</p>
<b>Existing human activities</b>	Interference with other users of the marine environment.	-
<b>Coastal sensitivities</b>	Vulnerability to oil spills.	<p>1. EN, SNH and JNCC websites - provide up-to-date, detailed information on conservation sites.</p> <p>2. JNCC Marine Natura 2000 consultation: The use of generic guidance for extending existing SPAs for breeding seabirds (2004).</p>

**Notes:**

1. All SEA Technical Reports and Consultation Documents are available on the DTI SEA website ([www.offshore-sea.org.uk](http://www.offshore-sea.org.uk)).
2. Report available on the OLF website ([www.olf.no](http://www.olf.no)).

## 10.2.4 SEA 4

### SEA 4 overview

Broadly, the SEA 4 area consists of two contrasting environments; an area of continental shelf and upper slope to the north and west of Orkney and Shetland characterised by relatively high temperatures, hydrodynamic energy and primary productivity; and the much colder, less dynamic and dark waters of the deep Faroe-Shetland and Faroe Bank Channels (described previously for SEA 1).

On shelf areas, the high sediment mobility associated with tidal and wave action results in mobile and often patchy benthic habitats with the high productivity of benthic and fish species assemblages driven by a highly seasonal input of phytoplankton and detrital carbon. There is also a coupling, to some degree, of the shelf ecosystem to productive coastal, intertidal and terrestrial systems through the export of detritus, and through foraging and seasonal migrations of fish, seabirds and marine mammals.

The deep channels and basins of the SEA 4 area are characterised by a lower hydrodynamic energy, although still mobile (and in places erosive) seabed environment; contrasting with most other areas in comparable water depth which are more quiescent and depositional. There is distinct zonation of species assemblages with depth; and less direct pelagic-benthic coupling. Vertical transfers of carbon and energy also result from diurnal migrations of zooplankton, cephalopods and fish, and predation on squid and fish by marine mammals. Near-surface predation on zooplankton, cephalopods and fish by seabirds is probably less intense than in coastal waters, due to distance from breeding colonies.

The deepwater SEA 4 area has been described (SEA 4 assessment workshop) as being of considerable scientific and conservation interest, as a result of the presence in close spatial proximity of contrasting seabed habitats and communities. Deep water cetacean populations of the SEA 4 area are of national and international significance. Coastal habitats and communities adjacent to the area are widely recognised as being of high conservation value, associated particularly with breeding seabird and seal colonies. Offshore, an area of the Wyville Thomson Ridge has been proposed as an SAC for reef habitat and similar habitat in the Judd Deeps may be protected in the future following further survey work. In addition, the Pilot Whale diapirs (mud volcanoes) in the north of the area are large features with the possible presence of seep chemosynthetic communities and are of conservation interest.

A large number of internationally important seabird colonies are found on the cliffs of the SEA 4 area coast and huge numbers of breeding seabirds are associated with these in spring and early summer. After the breeding season, species such as fulmar, gannet, kittiwake, guillemot, puffin and razorbill leave coastal waters and disperse offshore to feed. Coastal and sheltered waters also support important populations of migratory and wintering wildfowl and waders, as well as breeding birds.

A wide variety of marine mammals occur in the SEA 4 area, with internationally important numbers of grey and common seals found at coastal breeding colonies. The most common cetaceans sighted in shelf waters are harbour porpoise, minke whale and white-beaked dolphin. Offshore species include Atlantic white-sided dolphin, long-finned pilot whale, killer whale, sperm whale and fin whale, some of which are thought to migrate through the area. Several species of beaked whale are thought to inhabit deeper water in the Faroe-Shetland Channel, although there is very little information concerning these species. Hooded seals, which breed in the Arctic, are found in considerable numbers in the deeper waters of the SEA 4 area.



Fisheries are very important in parts of the SEA 4 area. There are several demersal fisheries of which the mixed fishery for cod, haddock and whiting is the most important. The main pelagic fisheries are for herring and mackerel and there are industrial fisheries for sandeel and blue whiting.

Parts of the area have been licensed for oil & gas exploration since 1965 and approaching 200 exploration and appraisal wells have been drilled to date. There are currently three major oilfields in production (Foinaven, Schiehallion and Clair) with the significant Rosebank/Lochnagar discovery undergoing further appraisal. Since SEA 4, levels of exploration and appraisal drilling to the west of Shetland have remained low however the first half of 2005 has seen more development drilling (7 wells) in the region than took place throughout the whole of 2004 (6 wells). The Sullom Voe and Flotta oil terminals provide facilities for the export of resources from developments to the east and west of the islands. A pipeline transports surplus gas from the Clair, Foinaven and Schiehallion fields to the Sullom Voe terminal where the gas is enhanced with natural gas liquids before being piped to the Magnus oilfield in the northern North Sea for use in enhanced oil recovery. Exploration success in adjacent Faroese waters has been limited to date (e.g. the Marjun appraisal well was deemed not to contain sufficient hydrocarbons to justify a well test). However, the Rosebank/Lochnagar discovery and the recent licence awards as part of the second Faroese licensing round may stimulate exploration activity in the region.

In addition to the oil and gas industry and commercial fisheries, the SEA 4 area provides an important resource for a number of other users. The area experiences low to moderate shipping pressures and a proportion of this involves tanker traffic to and from the Sullom Voe and Flotta oil terminals. Much of the SEA 4 coast is rural in nature and attracts tourists to its unspoilt scenery and natural history interest. Sheltered coastal waters are important for both finfish and shellfish cultivation.

The coastal region supports many prehistoric sites and due to changes in relative sea level, prehistoric submarine archaeological remains of up to about 9,000 years old could occur in the SEA 4 area down to water depths of around 150m. However, despite the potential for sites, marine archaeological discoveries are very rare primarily due to the strong currents and exposed nature of much of the shelf area. There are a large number of identified wrecks throughout the area, some of which are protected.

The SEA 4 area is remote from areas of major industrial activity. However, there are local sources of various contaminants and the atmospheric and hydrographic transport of persistent contaminants into the SEA 4 area has probably resulted in detectable pollution throughout the region. However, contaminant concentrations in water and sediments are typically at background levels.

### SEA context and new information for SEA 4 area

Summary	Implications for SEA	Post SEA Information Sources
<b>Geology &amp; substrates</b>	Biodegradation & accumulation of contaminants Range of benthic habitats present Physical disturbance, creating mounds or scars.	-
<b>Climate &amp; Meteorology</b>	Oil spill trajectory. Atmospheric dispersion.	-



Summary	Implications for SEA	Post SEA Information Sources
<b>General bathymetry</b>	Dispersion of discharges. Seabed features of potential conservation interest.	-
<b>Water masses</b>	Pattern of discharge dispersion. Rate of degradation of organic material. Spilled oil behaviour.	-
<b>Water currents and waves</b>	Spilled oil behaviour & response options. Particulate dispersion & re-dispersion.	-
<b>Existing contamination</b>	Discharge quality criteria.	Risk assessment of reproductive effects of alkyl phenols in produced water on fish stocks in the North Sea (OLF 2005) <sup>2</sup> .
<b>Plankton</b>	Vulnerability to spills. Pelagic-benthic system coupling, rapid transfer of material to seabed.	Macrozooplankton in the Faroe-Shetland Channel (Faroese Fisheries Laboratory 2003) <sup>3</sup> .
<b>Benthos</b>	Vulnerable faunal community or species. Rate of recovery. Contaminant transfer into food web. Smothering & changed sediment type.	1. Axelsson (2003) Ph.D. thesis 2. Roberts <i>et al.</i> (2003) paper on <i>Lophelia</i> coral and seabed mounds 3. Van Gaever <i>et al.</i> (2004) paper on meiofauna of the Darwin Mounds
<b>Cephalopods</b>	Possible vulnerability to drilling & operational discharges & spills.	-
<b>Fish</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	1. Prime Minister's Strategy Unit (2004) report "Net Benefits, a sustainable and profitable future for UK fishing" 2. Royal Society of Edinburgh (2004) "Inquiry into the Future of the Scottish Fishing Industry"
<b>Marine reptiles</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	UK & Eire marine turtle strandings & sightings annual reports (Penrose 2004, 2005).
<b>Seabirds (&amp; coastal birds)</b>	Vulnerability to oil spills.	Seabird populations of Britain & Ireland. Mitchell <i>et al.</i> (2004). Published results of Seabird 2000. The most recent & comprehensive study of the 25 species of seabird which breed in Britain & Ireland.
<b>Seals</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	-
<b>Cetaceans</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. Underwater ambient noise. SEA 6 Technical report (Harland <i>et al.</i> 2005) <sup>1</sup> . 2. SCANS 2 survey currently in progress.

Summary	Implications for SEA	Post SEA Information Sources
<b>Potential offshore conservation sites</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. JNCC 04 P23 paper - Progress in identifying SACs for Annex I habitats, including proposals for four offshore habitat SACs (Johnston <i>et al.</i> 2004a). 2. JNCC 04 P05 paper - Update on progress in marine Natura (Johnston <i>et al.</i> 2004b). 3. JNCC 04 N08 paper – Developing the concept of an ecologically coherent network of OSPAR Marine Protected Areas (JNCC 2004) 4. The Wyville Thomson Ridge has been identified as a potential SAC 5. JNCC 05 P10 paper (Turnbull <i>et al.</i> 2005)
<b>Existing human activities</b>	Interference with other users of the marine environment.	Fishing data for the Faroes (DNV 2005) <sup>3</sup> .
<b>Coastal sensitivities</b>	Vulnerability to oil spills.	1. SNH and JNCC websites - provide up-to-date, detailed information on conservation sites. 2. JNCC Marine Natura 2000 consultation: The use of generic guidance for extending existing SPAs for breeding seabirds (2004).

*Notes:*

1. Technical Reports are available on the DTI SEA website ([www.offshore-sea.org.uk](http://www.offshore-sea.org.uk)).
2. Report available on the OLF website ([www.olf.no](http://www.olf.no)).
3. Report available on the Faroese Oil Industry Group (FOÍB) website (<http://www.foib.fo/FoibPortal/DesktopDefault.aspx?tabid=113>).

## 10.2.5 SEA 5

### SEA 5 overview

The SEA 5 area is bounded to the west by the continental shelves of Shetland, Orkney and the Scottish mainland and to the north and east by the deep basins of the northern North Sea. The seabed over the area is relatively flat deepening to the north and east with localised depressions (e.g. the Southern Trench) and highs (e.g. Smith Bank, Pobie Bank). Sediments consist predominantly of sands, sandy gravels and gravel, particularly in nearshore areas with strong currents. Muddy sediments are restricted to deeper waters and sheltered coastal areas.

Cliffs and large firths and estuaries characterise much of the coast of the Scottish mainland with the Shetland and Orkney archipelagos displaying a variety of coastal habitats, many of which are protected by international and national conservation designations. Potential reef habitat to the east of Shetland may be designated as an offshore SAC in the future following further survey work.

Water circulation in SEA 5 is dominated by significant inflows of Atlantic water. Inflow variability associated with NAO-related atmospheric forcing can result in significant seasonal and annual changes to circulation patterns and water masses with profound implications for the circulation of nutrients and contaminants, and for the supply of oceanic planktonic species and fish larvae. For example, in recent years, spring and autumn plankton blooms have become more evident and primary production has increased throughout the year. Recent changes in the abundance of key zooplankton species (e.g. copepods *Calanus helgolandicus* and *C. finmarchicus*) with potentially important ecological (and economic) consequences have been linked to changes in sea surface temperatures.

The nature and extent of benthic communities are linked to the physical nature and characteristics of the substrate. Offshore communities are spatially distributed over large scales, with distinctive species assemblages associated with particular substrate types. Sedentary species with high abundance and biomass dominate sheltered coastal areas whereas exposed beaches have lower diversity, abundance and biomass. Dense populations of intertidal benthos in many of the sheltered inner firths and estuaries support important fish populations.

Fish spawning areas are found throughout SEA 5 with the juvenile stages of many commercial fish species remaining within coastal nursery areas for a year or two before moving offshore. Offshore areas are characterised by fish communities dominated by haddock, whiting and cod. Migratory species such as herring and mackerel are also found although their distribution is seasonal. Sandeels, a key prey species for a number of seabird and marine mammal species are associated with well-oxygenated sandy sediments. Diadromous species such as salmon, sea lamprey and eels are present with coastal rivers supporting internationally important populations. Commercially important *Nephrops* stocks are found on muddy-sand sediments within the Moray Firth, Firth of Forth and offshore on the Fladen Ground.

The abundant intertidal benthos of the inner firths and estuaries also supports large numbers of breeding, over-wintering and migratory waterbirds. The extensive coastal cliffs of the region support breeding seabirds including auks, kittiwakes, fulmars and gannets with important feeding areas in both nearshore and offshore waters. Many of these bird populations and aggregations are internationally important and protected as Special Protection Areas with work ongoing to extend coastal sites and identify new marine SPAs in the region.

Other key predators include marine mammals which are present in both coastal and offshore waters. The harbour porpoise is the most abundant cetacean species, particularly in summer with white-beaked dolphins and minke whales also present during summer months. A resident population of bottlenose dolphins also inhabits coastal waters of eastern Scotland, particularly the inner Moray Firth where they are protected by an SAC designation. Both grey and common seals forage extensively within the area, targeting fish and cephalopods with coastal areas supporting important breeding colonies for both species. Given the importance of the region for marine mammal species listed on Annex II of the Habitats Directive (i.e. harbour porpoise, bottlenose dolphin, grey and common seals), application of the Directive offshore may, following further research, result in further areas of SEA 5 being protected for these species.

The SEA 5 area supports a range of human activities including recreation, tourism and industrial uses. Coastal areas support significant oil and gas infrastructure with key distribution ports providing a focus for shipping in the area. The Beatrice platform in the Moray Firth represents the only significant offshore infrastructure in the area. Proposals to develop the platform to support an offshore windfarm are under development with a two turbine demonstrator project currently at a consultation stage. In general, coastal development has centred upon the large firths with much of the rest of the coast rural in nature. The fishing industry, whilst generally in decline, remains a key industry for many communities in the area, as is aquaculture on Shetland and Orkney. Generally, anthropogenic contamination of the marine environment is low and restricted largely to industrialised coastal areas.

Coastal and offshore areas of SEA 5 contain important archaeological remains dating back to prehistoric times. A large number of archaeological sites have been identified and some

protected, although evidence suggests that a large number of sites in both the coastal and marine environment have yet to be discovered.

### SEA context and new information for SEA 5 area

Summary	Implications for SEA	Post SEA Information Sources
<b>Geology &amp; substrates</b>	Biodegradation & accumulation of contaminants Range of benthic habitats present Physical disturbance, creating mounds or scars.	Sand banks, sand transport and offshore wind farms (Kenyon & Cooper 2005) <sup>1</sup> .
<b>Climate &amp; Meteorology</b>	Oil spill trajectory. Atmospheric dispersion.	-
<b>General bathymetry</b>	Dispersion of discharges. Seabed features of potential conservation interest.	-
<b>Water masses</b>	Pattern of discharge dispersion. Rate of degradation of organic material. Spilled oil behaviour.	-
<b>Water currents and waves</b>	Spilled oil behaviour & response options. Particulate dispersion & re-dispersion.	-
<b>Existing contamination</b>	Discharge quality criteria.	Risk assessment of reproductive effects of alkyl phenols in produced water on fish stocks in the North Sea (OLF 2005) <sup>2</sup> .
<b>Plankton</b>	Vulnerability to spills. Pelagic-benthic system coupling, rapid transfer of material to seabed.	-
<b>Benthos</b>	Vulnerable faunal community or species. Rate of recovery. Contaminant transfer into food web. Smothering & changed sediment type.	-
<b>Cephalopods</b>	Possible vulnerability to drilling & operational discharges & spills.	-
<b>Fish</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	-
<b>Marine reptiles</b>	Possible vulnerability to drilling & operational discharges or spills. Timing of seismic surveys.	UK & Eire marine turtle strandings & sightings annual reports (Penrose 2005).
<b>Seabirds (&amp; coastal birds)</b>	Vulnerability to oil spills.	-
<b>Seals</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	Satellite tracking of seals (Hammond <i>et al.</i> 2005)
<b>Cetaceans</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. Underwater ambient noise. SEA 6 Technical report (Harland <i>et al.</i> 2005) <sup>1</sup> . 2. SCANS 2 survey currently in progress.

Summary	Implications for SEA	Post SEA Information Sources
<b>Potential offshore conservation sites</b>	Potential disturbance by seismic noise. Vulnerability to oil spills.	1. JNCC 04 P23 paper – Progress in identifying SACs for Annex I habitats, including proposals for four offshore habitat SACs (Johnston <i>et al.</i> 2004a). 2. JNCC 04 P05 paper - Update on progress in marine Natura (Johnston <i>et al.</i> 2004b). 3. JNCC 04 N08 paper – Developing the concept of an ecologically coherent network of OSPAR Marine Protected Areas (JNCC 2004). 4. Underwater ambient noise. SEA 6 Technical report (Harland <i>et al.</i> 2005) <sup>1</sup> .
<b>Existing human activities</b>	Interference with other users of the marine environment.	Ongoing development of the Beatrice windfarm proposal.
<b>Coastal sensitivities</b>	Vulnerability to oil spills.	1. SNH and JNCC websites - provide up-to-date, detailed information on conservation sites. 2. JNCC Marine Natura 2000 consultation: The use of generic guidance for extending existing SPAs for breeding seabirds (2004).

## Notes:

1. Technical Reports are available on the DTI SEA website ([www.offshore-sea.org.uk](http://www.offshore-sea.org.uk)).
2. Report available on the OLF website ([www.olf.no](http://www.olf.no)).

## 10.3 Perspectives on prospectivity, scenarios and activity

### 10.3.1 Overview

The previous SEAs (1-5) have provided estimates of the potential hydrocarbon prospectivity expected for the individual SEA areas after each award round covering the respective SEAs. From the 21<sup>st</sup> Licensing Round (2003), blocks have been re-offered in previous SEA areas.

In the 23<sup>rd</sup> Seaward Licensing Round, 152 Production Licences have been offered to 99 companies, the highest number since licensing began in 1964. The offers include 70 traditional, 6 frontier and 76 promote licences.

Figure 10.1 overleaf shows the blocks that were offered for licence in the 23<sup>rd</sup> Round, while Figure 10.2 shows the blocks that have been awarded (subject to confirmation). The maps show that the main acreage under offer was in SEA areas 1, 3, 4 and 5 with fewer blocks available for licensing in SEA 2 (Figure 10.1). Despite this, the actual uptake of blocks and the number of licences awarded in SEA 2 has remained relatively high compared to the other areas.

In the following sections, more information is provided about the activity predicted for each SEA area and the actual work programmes accepted by the DTI as part of the licence award. The changes that have occurred in block licensing status between the time of the relevant SEAs and today are also given.

Comparisons have been made based upon licensing activity within each SEA area for consistency with previous years; it should be noted however that the re-offer of blocks has meant that some licences, and therefore work programmes also, may be shared with adjacent SEA areas.

Figure 10.1 – Map showing the blocks offered for the 23<sup>rd</sup> Licensing Round and the licensing status of the remaining blocks before the 23<sup>rd</sup> Licence Awards.

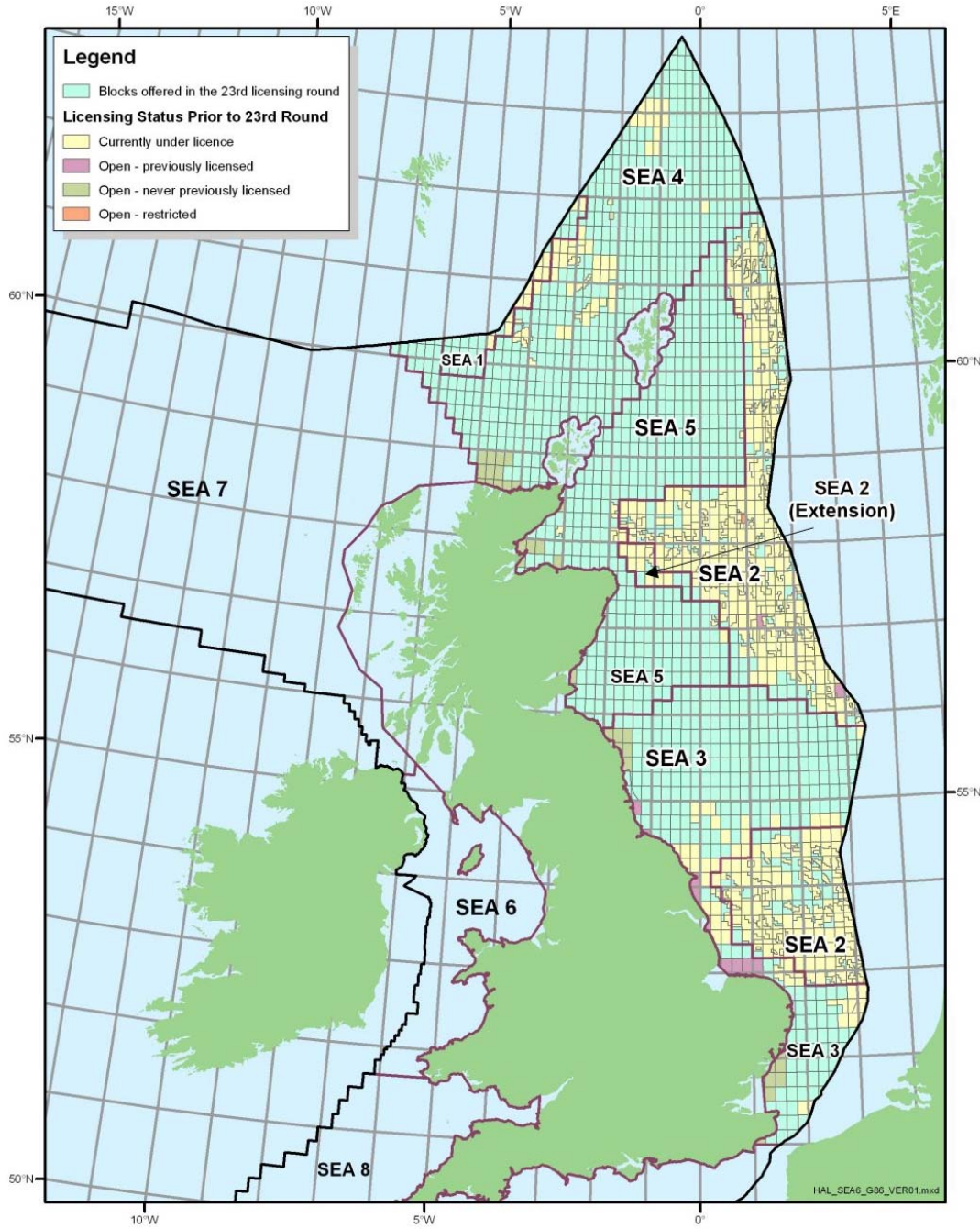
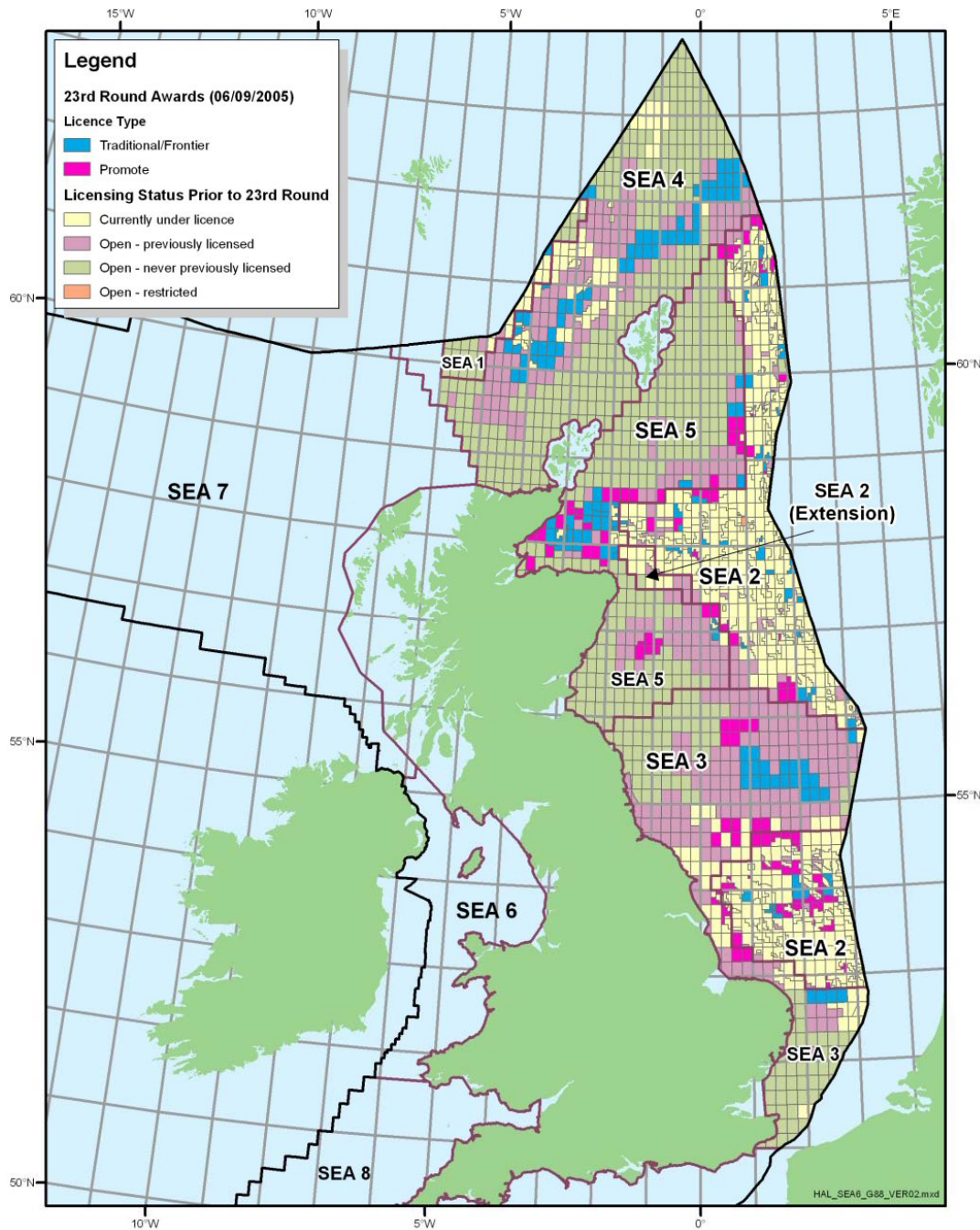




Figure 10.2 – Map showing the blocks awarded in the 23<sup>rd</sup> Licensing Round and the current licensing status of the remaining blocks.



### 10.3.2 SEA 1

The licences awarded for SEA 1 in the 19<sup>th</sup> Round all had existing 3D seismic data and therefore the majority of work programmes offered reprocessing of existing 3D surveys rather than the collection of new data. Additionally, only some blocks had a commitment to acquire new 2D seismic surveys. In subsequent rounds, work programmes for seismic data have remained low, both for the collection of seismic data and exploration drilling, with only 2 licences awarded in the 23<sup>rd</sup> Round.



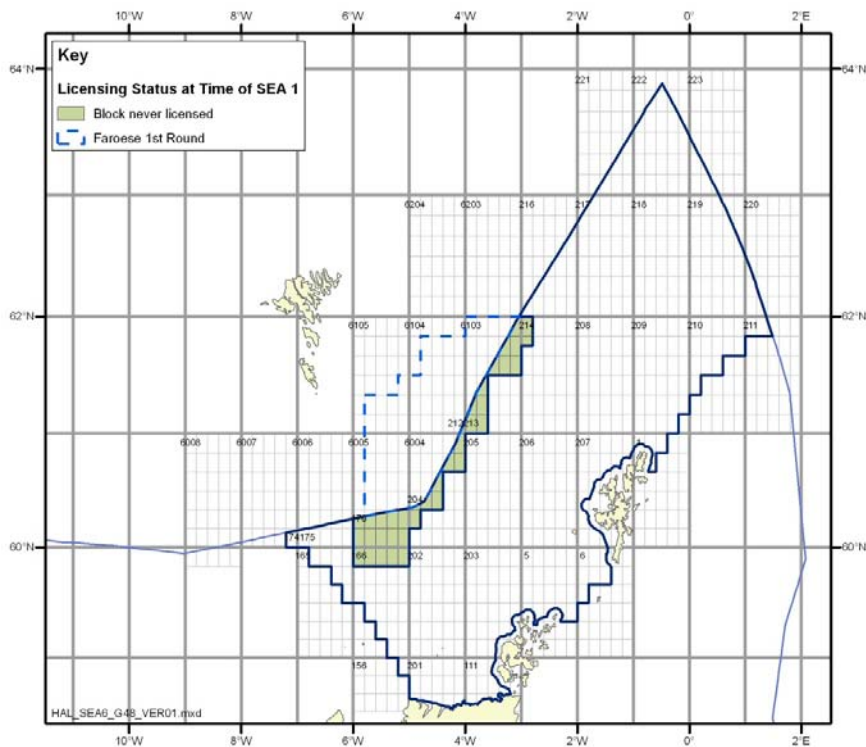
SEA 1 predicted and actual activity levels

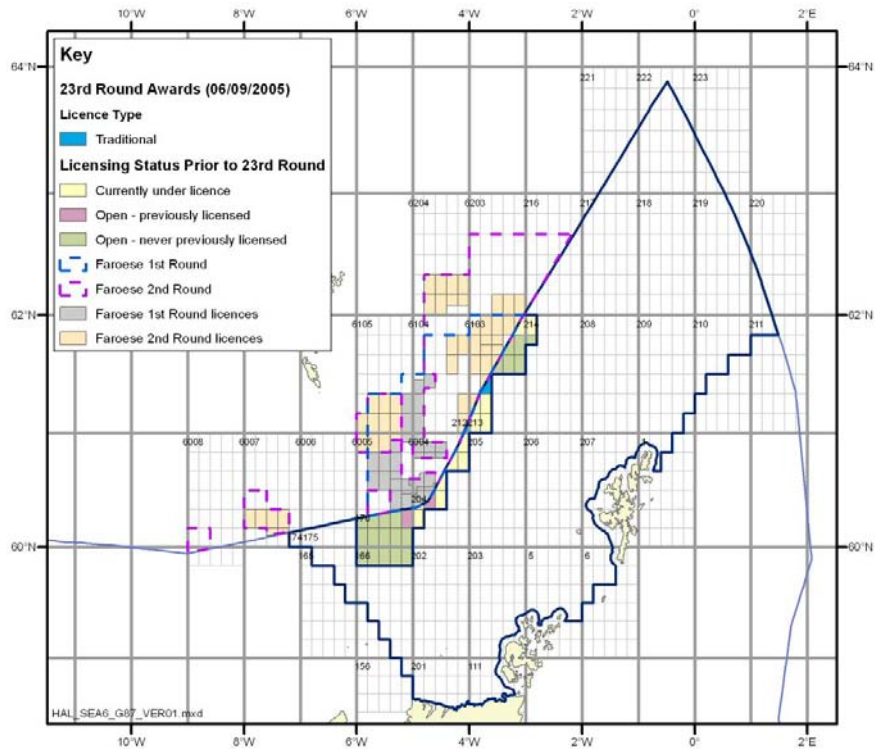
Award Round	Seismic surveys		Exploration wells	
	Predicted	Programmes Bid <sup>1</sup>	Predicted	Programmes Bid
19 (2001)	10	5 Firm 3 Contingent, D/D	15	7 Firm 6 Contingent 3 D/D
Re-offer 22 (2004)	-	2 Firm <sup>2</sup>	-	1 Contingent 2 D/D
Re-offer 23 (2005) <sup>3</sup>	-	2 Firm	-	2 D/D

Notes:

1. Where work programmes have indicated, “acquire seismic data” or “acquire and reprocess data”, this has been interpreted for comparison purposes as a new seismic survey although it can also represent the purchase of existing seismic data i.e. not involving new survey. Reprocessing of existing seismic data has not been included.
2. Some licence awards include blocks that are within another SEA area, and therefore a work programme may be carried out within the other SEA.
3. Licences for the 23<sup>rd</sup> Round were awarded on the 6<sup>th</sup> September 2005. The work programmes indicated here remain to be confirmed, dependent upon awards being accepted.

Figure 10.3 – Pair of maps of blocks within the SEA 1 area indicating licensing status before the 19<sup>th</sup> licensing round (this page) and the current licensing status since the 23<sup>rd</sup> licensing round (overleaf)





### 10.3.3 SEA 2 & SEA 2 Extension

The SEA 2 areas cover the mature area of the North Sea (those areas that have been licensed since the early days of oil and gas exploration in the North Sea). Most blocks in this area are currently under licence or have previously been licensed, with very few that have never been licensed. Consequently, there is already extensive seismic coverage of most of the area; nevertheless, work programmes to carry out further seismic surveys have steadily increased since the 20<sup>th</sup> Round. As anticipated, take-up of relinquished blocks in the SEA 2 area has remained high. In the 23<sup>rd</sup> Round, there are 5 firm commitments to drill exploration wells in the central North Sea (subject to confirmation). These are shown in Figure 10.4.

In the SEA 2 Extension there has been little activity since the 21<sup>st</sup> Round, with no licences awarded for blocks that were re-offered in the 23<sup>rd</sup> Round.

#### SEA 2 predicted and actual activity levels

Award Round	Seismic surveys		Exploration wells	
	Predicted	Programmes Bid <sup>1</sup>	Predicted	Programmes Bid
20 (2002)	16	11 Firm 3 Contingent, D/D	21	4 Firm 5 Contingent 19 D/D
Re-offer 21 (2003)	-	43 Firm 3 Contingent, D/D	-	3 Firm 4 Contingent 64 D/D
Re-offer 22 (2004)	-	58 Firm <sup>2</sup> 14 Contingent, D/D	-	2 Firm 4 Contingent 65 D/D <sup>2</sup>
Re-offer 23 (2005) <sup>3</sup>	-	73 Firm <sup>2</sup> 15 Contingent, D/D <sup>2</sup>	-	5 Firm 4 Contingent 78 D/D <sup>2</sup>

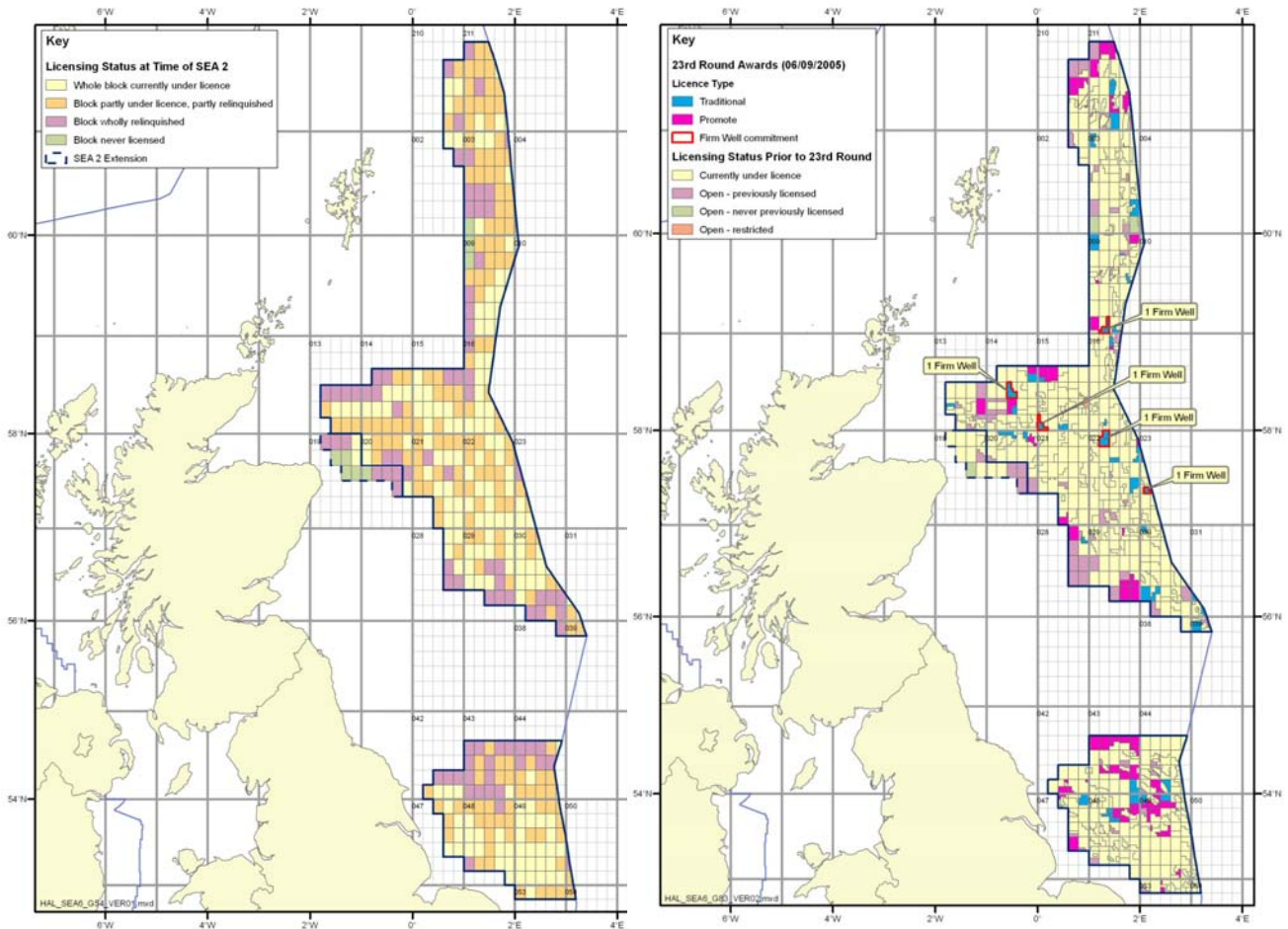
SEA 2 Extension predicted and actual activity levels

Award Round	Seismic surveys		Exploration wells	
	Predicted	Programmes Bid <sup>1</sup>	Predicted	Programmes Bid
21 (2003)	3	5 Firm	11	5 Firm 5 Contingent 2 D/D
Re-offer 22 (2004)	-	1 Firm	-	1 D/D

Notes:

1. Where work programmes have indicated, “acquire seismic data” or “acquire and reprocess data”, this has been interpreted for comparison purposes as a new seismic survey although it can also represent the purchase of existing seismic data i.e. not involving new survey. Reprocessing of existing seismic data has not been included.
2. Some licence awards include blocks that are within another SEA area, and therefore a work programme indicated here may actually be carried out within the other SEA.
3. Licences for the 23<sup>rd</sup> Round were awarded on the 6<sup>th</sup> September 2005. The work programmes indicated here remain to be confirmed, dependent upon awards being accepted.

Figure 10.4 – Pair of maps of blocks within the SEA 2 area indicating licensing status before the 20<sup>th</sup> licensing round (left) and the current licensing status since the 23<sup>rd</sup> licensing round (right)



### 10.3.4 SEA 3

The SEA 3 area is regarded as an area of low prospectivity, and seismic and drilling activity has been relatively low compared to the adjacent SEA 2 blocks. In the 23<sup>rd</sup> Round, the uptake of blocks has been moderate compared to the number offered; this is in line with expectations during the original SEA and 20<sup>th</sup> Round. Despite this, there is a commitment to drill one firm well.

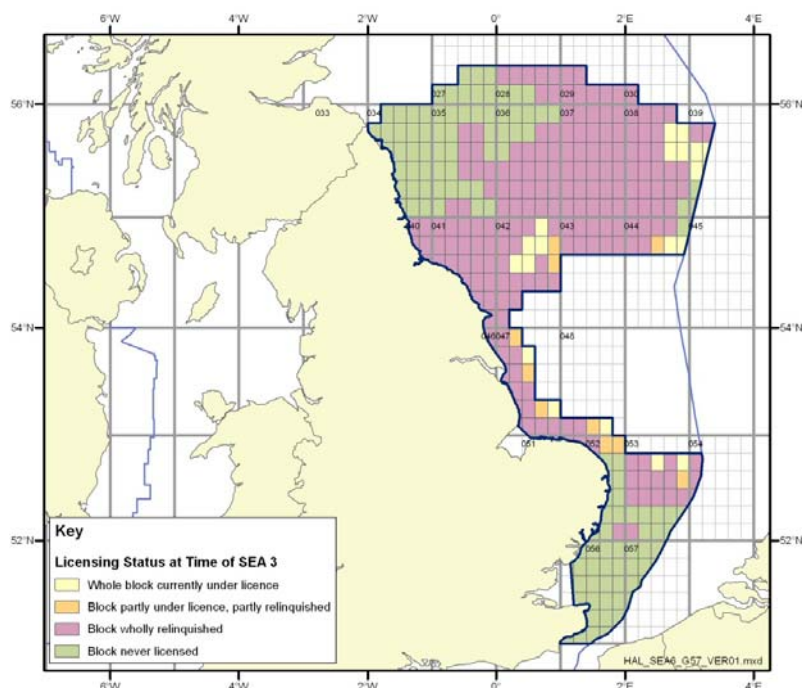
#### SEA 3 predicted and actual activity levels

Award Round	Seismic surveys		Exploration wells	
	Predicted	Programmes Bid <sup>1</sup>	Predicted	Programmes Bid
21 (2003)	100-200km 2D 500- 2500km <sup>2</sup> 3D	8 Firm	15	11 D/D <sup>2</sup>
Re-offer 22 (2004)	-	8 Firm <sup>2</sup> 1 Contingent, D/D	-	1 Firm 7 D/D <sup>2</sup>
Re-offer 23 (2005) <sup>3</sup>	-	16 Firm <sup>2</sup> 2 Contingent, D/D <sup>2</sup>	-	1 Firm 1 Contingent 11 D/D <sup>2</sup>

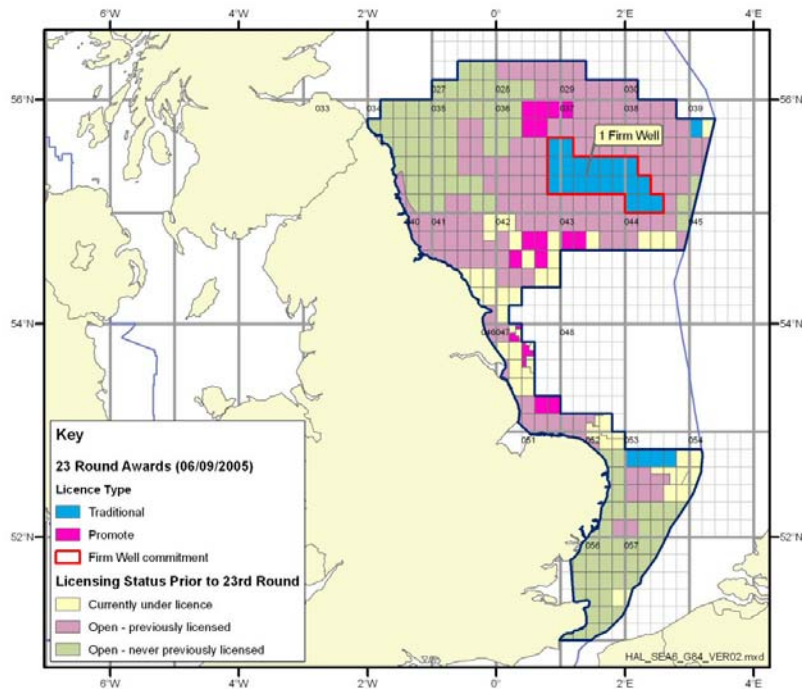
**Notes:**

1. Where work programmes have indicated, “acquire seismic data” or “acquire and reprocess data”, this has been interpreted for comparison purposes as a new seismic survey although it can also represent the purchase of existing seismic data i.e. not involving new survey. Reprocessing of existing seismic data has not been included.
2. Some licence awards include blocks that are within another SEA area, and therefore a work programme indicated here may actually be carried out within the other SEA.
3. Licences for the 23<sup>rd</sup> Round were awarded on the 6<sup>th</sup> September 2005. The work programmes indicated here remain to be confirmed, dependent upon awards being accepted.

Figure 10.5 – Pair of maps of blocks within the SEA 3 area indicating licensing status before the 21<sup>st</sup> licensing round (top) and the current licensing status since the 23<sup>rd</sup> licensing round (overleaf)







### 10.3.5 SEA 4

As with SEA areas 1 and 3, the prospectivity for blocks in SEA 4 is low with uptake of blocks in the 22<sup>nd</sup> Round expected to be around 10%. In the 23<sup>rd</sup> Round, uptake of re-offered blocks has remained low, although frontier licences have potentially increased the number of awards made. There are firm commitments to drill 3 wells in areas that were previously licensed.

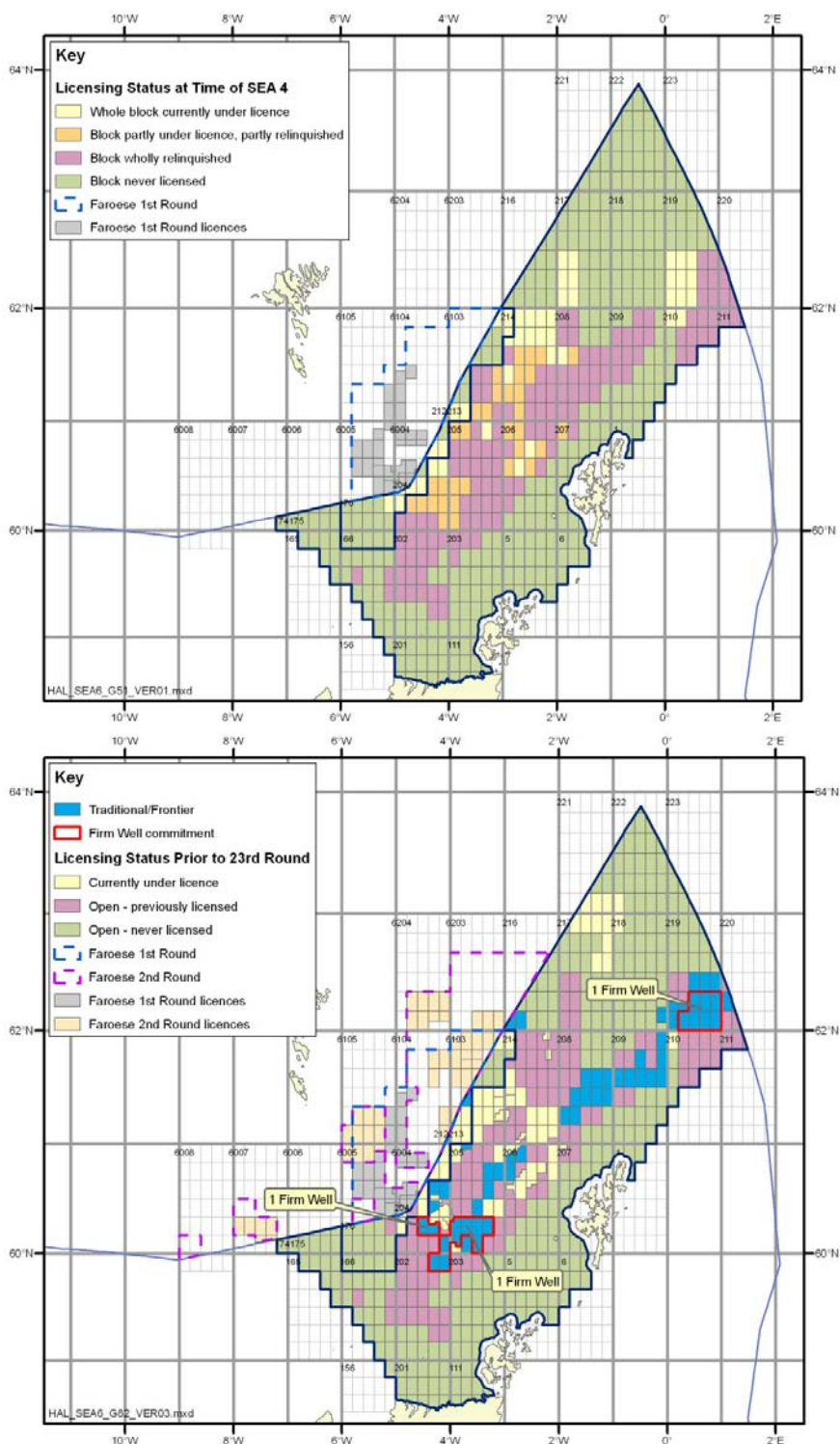
#### SEA 4 predicted and actual activity levels

Award Round	Seismic surveys		Exploration wells	
	Predicted	Programmes Bid <sup>1</sup>	Predicted	Programmes Bid
22 (2004)	17	7 Firm <sup>2</sup> 1 Contingent, D/D	8	2 Contingent <sup>2</sup> 12 D/D
Re-offer 23 (2005) <sup>3</sup>	-	12 Firm 2 Contingent, D/D	-	3 Firm 1 Contingent 12 D/D

**Notes:**

1. Where work programmes have indicated, “acquire seismic data” or “acquire and reprocess data”, this has been interpreted for comparison purposes as a new seismic survey although it can also represent the purchase of existing seismic data i.e. not involving new survey. Reprocessing of existing seismic data has not been included.
2. Some licence awards include blocks that are within another SEA area, and therefore a work programme indicated here may actually be carried out within the other SEA.
3. Licences for the 23<sup>rd</sup> Round were awarded on the 6<sup>th</sup> September 2005. The work programmes indicated here remain to be confirmed, dependent upon awards being accepted.

Figure 10.6 – Pair of maps of blocks within the SEA 4 area indicating licensing status before the 22<sup>nd</sup> licensing round (top) and the current licensing status since the 23<sup>rd</sup> licensing round (bottom)



### 10.3.6 SEA 5

The greatest areas of prospectivity in the SEA 5 region are thought to be in the areas south of the Unst Basin (Quadrants 2 and 8) and the Northern part of the Moray Firth, increasing

into the Inner Moray Firth. Estimates for activity in the SEA 5 region is therefore focussed on these areas. Licence awards in the 23<sup>rd</sup> Round indicate that the estimates were accurate, with 8 firm well commitments in the Northern and Inner Moray Firth and both traditional and promote licences awarded for blocks in quadrant 8.

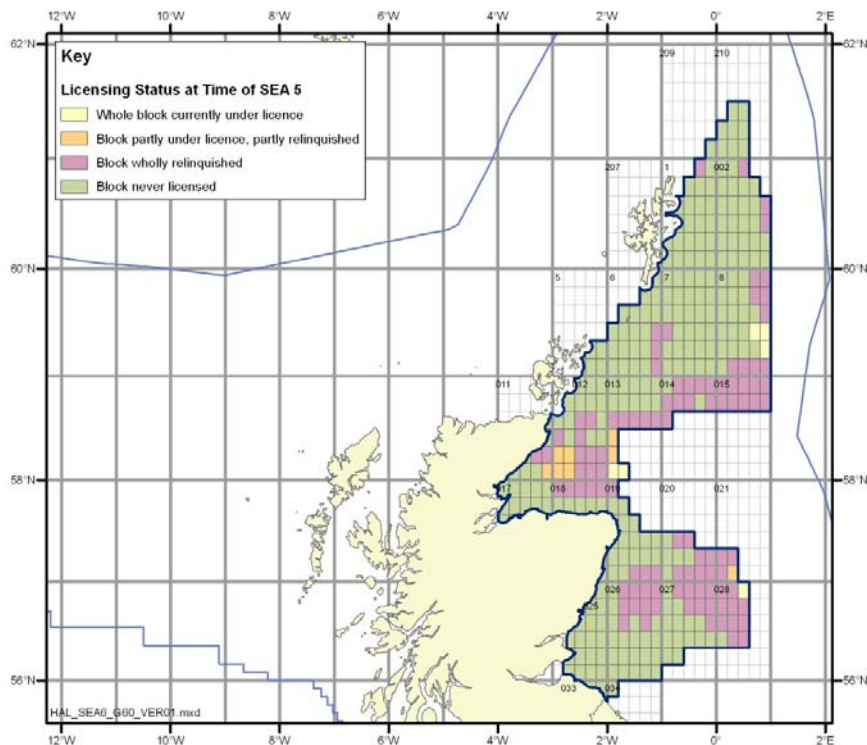
*SEA 5 predicted and actual activity levels*

Award Round	Seismic surveys		Exploration wells	
	Predicted	Programmes Bid <sup>1</sup>	Predicted	Programmes Bid
23 (2005) <sup>3</sup>	16	34 Firm <sup>2</sup> 4 Contingent, D/D <sup>2</sup>	12	8 Firm 4 Contingent 29 D/D <sup>2</sup>

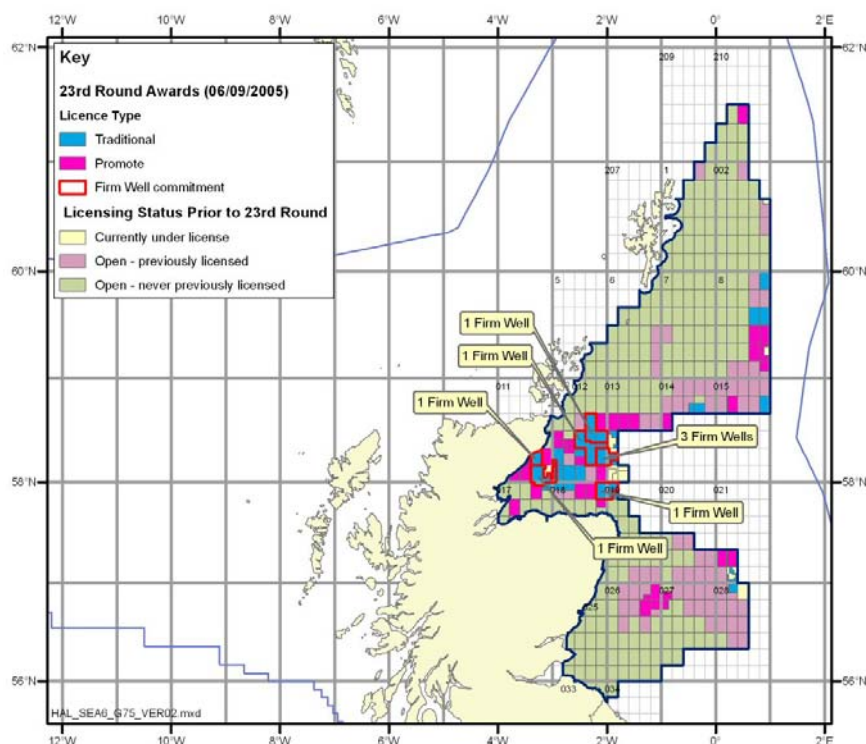
Notes:

1. Where work programmes have indicated, “acquire seismic data” or “acquire and reprocess data”, this has been interpreted for comparison purposes as a new seismic survey although it can also represent the purchase of existing seismic data i.e. not involving new survey. Reprocessing of existing seismic data has not been included.
2. Some licence awards include blocks that are within another SEA area, and therefore a work programme indicated here may actually be carried out within the other SEA..
3. Licences for the 23<sup>rd</sup> Round were awarded on the 6<sup>th</sup> September 2005. The work programmes indicated here remain to be confirmed, dependent upon awards being accepted.

*Figure 10.7 – Pair of maps of blocks within the SEA 5 area indicating licensing status before the 23<sup>rd</sup> licensing round (top) and the current licensing status since the 23<sup>rd</sup> licensing round (overleaf)*







## 10.4 Discussion

A summary of existing and new environmental regulations covering offshore oil and gas activities is given in Section 3 of this Environmental Report. In addition, the processes and potential areas for designation as coastal and offshore conservation sites have become clearer (see underpinning reports for SEA 2 onwards) although most offshore sites have yet to be proposed, with potential areas of qualifying habitat illustrated on the JNCC website.

Updates to the environmental information base for the various SEA areas are outlined in Section 10.2. These generally support the existing perspectives on sensitive features and species. Similarly, the new information on the effects of oil and gas activities has not shown any new significant or unanticipated sources of significant effect that would alter the conclusions of the earlier DTI SEAs.

Of relevance to previous SEA areas are the sites recently identified by the JNCC for potential designation as SACs. These are the Wyville Thomson Ridge (SEA 1 and 4), the Dogger Bank (SEA 2 and 3), Norfolk Banks SEA 2 and 3), the Saturn reef (SEA 3), the Scanner pockmark (SEA 2), the North Norfolk sandbanks (SEA 2) and the Braemar pockmarks (SEA 2).

Following SEA 2, certain blocks in Quadrant 15 (Scanner pockmark) in the central North Sea were not offered for oil & gas licensing as they contained seabed gas pockmark features that were of conservation interest. This recommendation has been maintained through subsequent SEAs and licensing rounds in relation to reoffer of these blocks. The Joint Nature Conservation Committee has subsequently proposed pockmarks features in several blocks as offshore Special Areas of Conservation.

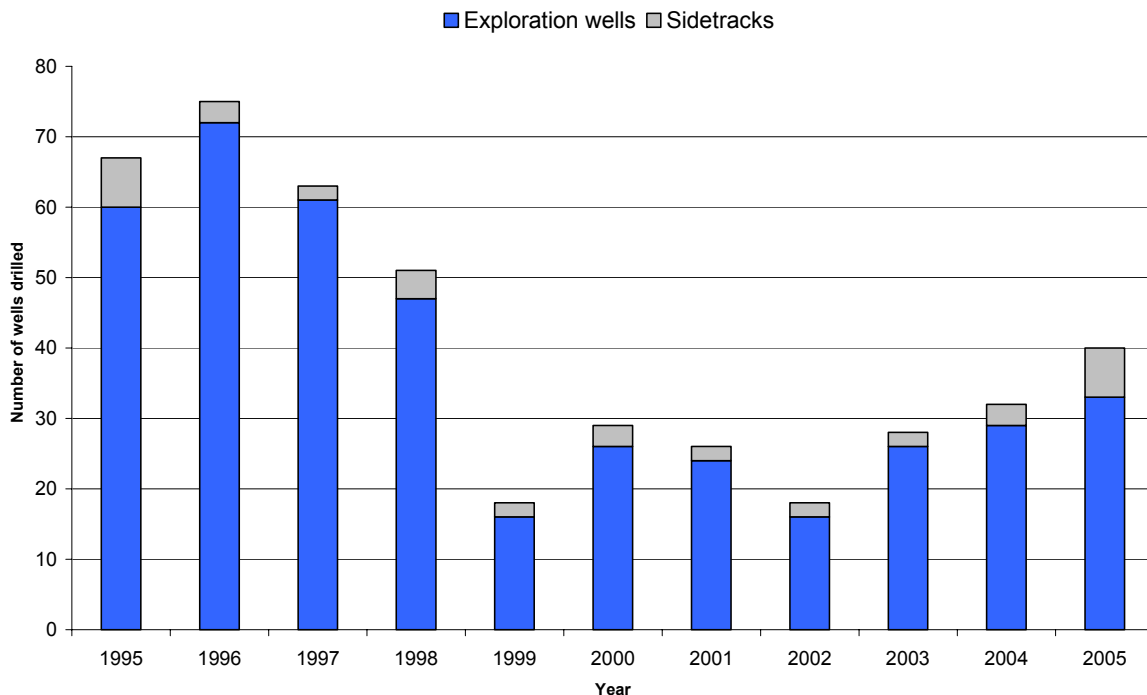
A report on the nature and sources of the gas supplying the pockmarks has been commissioned from the British Geological Survey and this is available as a downloadable document from the SEA website. On the basis of the BGS report conclusions, the DTI is

now considering offering blocks 15/20c and 15/25d for licence subject to strict spatial and other controls aimed at ensuring protection of the conservation interests they contain.

From this consideration it is concluded that the findings of the previous SEAs in terms of areas to be excluded from licensing or blocks requiring additional mitigation measures if licensed, remain generally valid. This assumes appropriate mitigation with respect to the recently identified conservation sites. Designation of an SAC would not preclude licensing as long as appropriate spatial or other necessary constraints are applied to prevent damage to the features of conservation interest. If blocks/part blocks previously excluded from licensing on environmental grounds are to be offered in subsequent licensing rounds, this needs to be supported by a documented rationale (typically based on better understanding of the features of interest in the blocks and the process that formed/maintain them).

As a context for the consideration of the likely scale of drilling activity which could follow a 24<sup>th</sup> offshore licensing round Figure 10.8 shows the number of exploration wells drilled on the offshore UKCS over the last ten years. The number of wells shows a general decline over time although with a slight increase over the last four years.

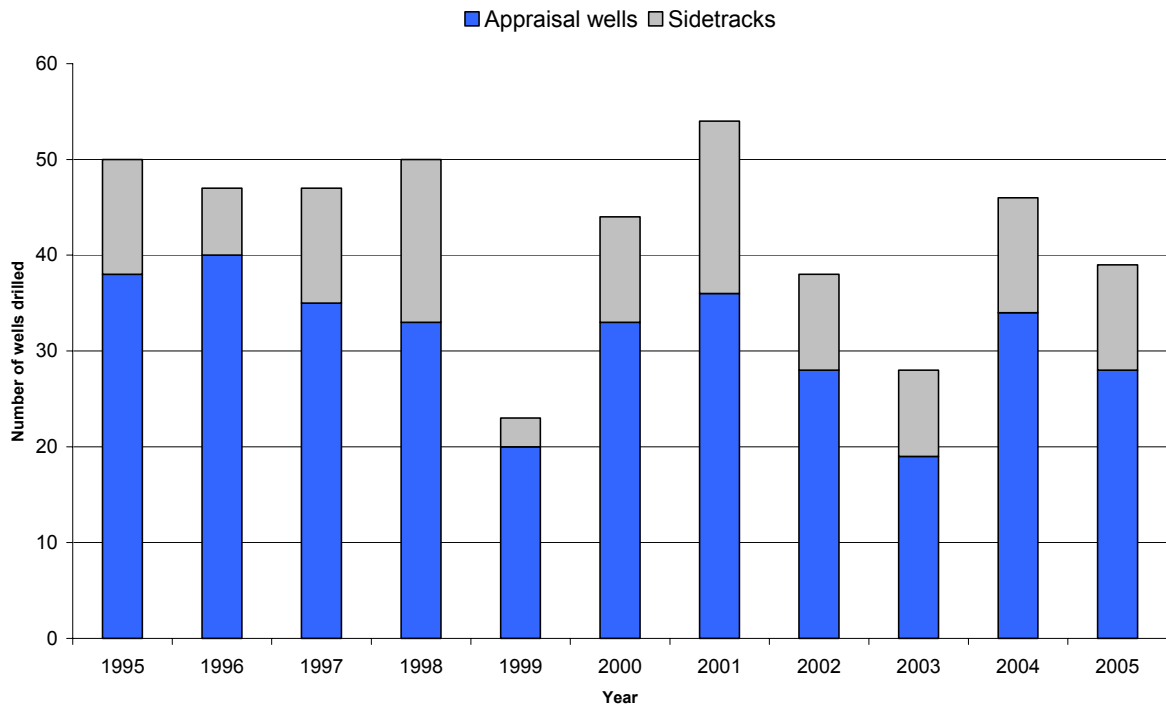
*Figure 10.8 – Number of exploration wells and their sidetracks drilled in all areas of offshore UKCS*



*Note: Sidetrack wells are only counted where the intent was to acquire new geological data. 2005 = quarters 1, 2 & 3 only. Source: DTI website*

In contrast to exploration wells, the number of appraisal wells shows less of a clear cut trend – see Figure 10.9.

Figure 10.9 – Number of appraisal wells and their sidetracks drilled in all areas of offshore UKCS



Note: Sidetrack wells are only counted where the intent was to acquire new geological data. 2005 = quarters 1, 2 & 3 only. Source: DTI website