

Preliminary assessment of white zone – potential area for 19th round of offshore licensing

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Introduction

A High Court judgement in November 1999 has led to the need to apply the Habitats and Birds Directives in UK waters beyond the 12 NM limit of territorial waters.

One of the requirements of the Habitats Directive is the selection, proposal of and subsequent designation of Special Areas of Conservation (SAC). These have to conform to the requirements of the Directive and cover a set of habitats listed in the Annexes to the Directive. It is believed that the only relevant habitats requiring protection through SAC under the Directive in UK offshore waters are shallow sandbanks and reefs. Offshore waters also need to be formally assessed for possible sites for harbour porpoises and bottlenose dolphins. Although the High Court judgement did not specifically refer to the Birds Directive, this exercise will also assess if there are any suitable sites for seabird (all species) Special Protection Areas (SPA) under the Birds Directive.

This report is the first to result from a process to formally review all offshore water areas under way within the Joint Nature Conservation Committee with funding direct from the Department of the Environment, Transport and the Regions and the Department of Trade and Industry.

Potential area for 19th round of offshore licensing

In 1999, the international boundary between UK and the Faroes was settled in waters to the north and west of Shetland. This boundary divided the previous “white zone” (of no hydrocarbon licensing) between UK and the Faroes. Some blocks within the newly agreed UK waters are likely to be offered for licensing in the 19th round of offshore oil licensing. As part of the work being carried out by JNCC, a potential area for licensing has been reviewed for DTI in this report.

The assessment

In this assessment,

- a) each of the potential white zone licensing blocks was examined to determine if relevant habitats that might be considered for inclusion in a possible offshore SAC series are present,
- b) the UK blocks surrounding the above were examined in the same way, in order to determine if the possibility of activity within the potential area might affect a possible future SAC,
- c) the area as a whole was examined to see if any bird or marine mammal concentrations are present.

The waters of the potential area are all greater than 180m in depth, thus “reefs” are the only relevant habitat in this area. Reefs are defined “Submarine, or exposed at low tide, rocky substrates and biogenic concretions, which arise from the sea floor in the sublittoral zone but may extend into the littoral zone where there is an uninterrupted zonation of plant and animal communities. These reefs generally support a zonation of benthic communities of algae and animals species including concretions, encrustations and corallogenic concretions” in the

Interpretation Manual of European Habitats EUR15/2 (October 1999). In this assessment, the precise definition of rocky has been taken widely and may be taken as any substantive area of rock larger than cobbles. This definition in particular is likely to be refined as the general offshore Natura 2000 project proceeds. It seems unlikely that a wider definition than this will be applied though. The degree to which a habitat has to “arise from the seabed” has not been defined here, but is unlikely to include a flat seabed.

Concentrations of species (harbour porpoise, bottlenose dolphin or seabirds), that might be considered as possible SACs or SPAs need to be considered in a similar way. Selection criteria for these have yet to be agreed. In the case of harbour porpoise, this matter is being considered at a European level, whereas for seabirds a process is under way in UK to assess all waters.

Information reviewed

The area of the white zone and waters west of Shetland has received a great deal of attention in recent years. Most of this has been associated with the search for and exploitation of oil resources in the area east of the white zone. Three surveys have examined the seabed in the area in a synoptic way. The first of these was in 1996 and covered a wide swath of seabed between the white zone and the shelf break west of Shetland (Bett 1997, Cordah 1998). This survey mapped the seabed using sidescan sonar imaging, followed by taking a set of seabed samples and photographs to gain a greater understanding of the sonar images. This was a relatively innovative approach to seabed mapping and gave a much broader view than would have been obtained using the traditional point sampling approach alone. Such sonar images can be used to identify areas of hard (rocky) seabed and any structure protruding from the seabed.

A similar pair of survey cruises was undertaken in 1998 covering areas both to the north and southwest of the 1996 survey area. The survey also examined two blocks immediately adjacent to the white zone (Blocks 204/14 and 204/15) (Bett 1999). In 1999, a similar survey was undertaken of the white zone, with some sampling being delayed until 2000 (Masson *et al.* 2000).

In addition to these wide-area synoptic surveys, the majority of wells drilled to the west of Shetland required an environmental impact assessment. Many companies undertook further seabed studies in the area of the wells (see literature list at end of report).

The review

Table 1 summarises the relevant literature covering the seabed of each of the licensing blocks reviewed. A note is given where there has been exploration or production, or where a block is wholly or partly licensed. Emboldened block numbers indicate those blocks in the potential area for the 19th round of Offshore Licensing.

Pollock *et al.* (2000) describe the distribution of seabirds and marine mammals in the area. While the shelf north-west of Scotland is important for widespread species such as fulmar *Fulmarus glacialis* and storm petrel *Hydrobates pelagicus*, there appear to be no specific concentrations within the licence block area, thus it is highly unlikely that any SPA or cetacean SAC will be proposed here.

Broadly, as described by Hartley Anderson (2000), the Potential area for the 19th round of offshore licensing is in deep water within the Shetland-Faroes Channel. With the exception of two blocks in the southeast of the area, all water depths are greater than 500m. This is the depth boundary between the southward flowing cold Arctic water in the Shetland-Faroes Channel and the north flowing warmer mixed Atlantic water.

The bottom sediment is heavily influenced by water flow in the area. To the north, at greater depth and lower current speeds on the seabed, the sediment is predominantly muds and muddy sand. Further south in the centre of the Faroes-Shetland Channel, sediments are much coarser, and the sand present is heavily sorted in and in some cases strongly rippled by the current. Sediments in the shallower areas are post-glacial sediments – in most cases the fine fractions have been removed leaving behind coarser, sediments including some boulders. In some cases, these have formed into ridges, some of which have been interpreted as the remnants of iceberg plough marks.

Reefs

Three types of feature occur or may occur in the Potential area for the 19th offshore licensing round. The first of these are the boulder ridges or piles in some shallower areas, left possibly as a remnant of iceberg plough marks. A few of these have been identified in 166/3, and in some of the adjacent blocks on the Wyville-Thompson Ridge (e.g. 165/4). Such boulder piles or ridges seem likely to be present throughout much of this area, but they have not been plotted or described.

The second feature that might occur in the area would be biological reefs, such as those sometimes formed by *Lophelia pertusa*. The temperature of the deeper water will however preclude the growth of *Lophelia pertusa* within the area. There is no evidence of *Lophelia pertusa* within the two shallower blocks that form part of the northern flank of the Wyville-Thompson Ridge. The waters surrounding the southern part of the Potential area are flanks of the Shetland-Faroes Channel, with the Wyville-Thompson Ridge at the southernmost part. There is some evidence that *Lophelia* grew in the past on the top of this ridge, and may still be doing so; there is however no evidence that any bioherms or larger areas of growth are present now. It seems likely that if these ever existed, they would have been likely to have been broken up by the actions of trawl gear working the area.

A final feature present may be of deep-water exposed rock. Two apparent erosion features showed up on the sonar images in deep water. One of these is noted in 176/22 as being 60m and possibly of exposed basalt basement rock (Masson *et al.* 2000); the feature apparently runs into 176/21. Other sources indicate that this feature is likely to be a cliff of Eocene sediments, possibly including some basalt (Stoker *et al.* in press). A second erosional scarp (not described as rock) is present in 176/25 and 176/20. If either or both of these features were of exposed rock, they would be unusual in such deep water away from volcanic zones.

Advice

On the basis of available evidence, habitats that might fall under the definition of reefs may occur in blocks 176/21 & 22 and 176/25 & 20 and in the iceberg ploughmark zone of 166/3. We consider, however, that the act of offering these blocks for licence would not in itself put these habitats at risk of degradation and therefore would not prejudice any judgement by the Secretary

of State as to whether these might become proposed SAC in future. If these blocks are offered for licence though, a clear warning needs to be placed on such an offer indicating their potential status, requiring further study before any exploration plan is submitted, and that some activities might be restricted or not be permitted owing to the possible presence of reefs.

As far as is possible to tell with present information, there do not appear to be any other habitats suitable for selection as SAC within the remainder of the Potential area for 19th round of offshore licensing.

In the UK blocks immediately surrounding the Potential area for 19th round of offshore licensing, there are no apparent habitats that would qualify as reefs, with the possible exception of areas around the iceberg ploughmarks on the northern flank and top of the Wyville Thompson Ridge. The same advice would apply to these habitats as in 166/3 above. It is worth noting that the summit of the Wyville Thompson Ridge is swept by a strong north-east bound current, thus any discharges to the north of this area (in the Potential area for 19th round of offshore licensing) would be unlikely to settle on the Ridge.

The precise criteria for selection of marine SPAs or offshore species SACs have yet to be agreed. However, the lack of concentrations and the generally low densities of relevant species in the area, mean that it is highly unlikely that either SPAs or offshore species SACs will be located in the Potential area for 19th round of offshore licensing.

Table 1. Summary of the seabed characteristics of each block in the Potential area for the 19th round of Offshore Licensing

The codes within the Information summary indicate summaries of grab samples from within the block. Note that these samples are not representative of the block as a whole, but were usually taken in order to interpret the sonar scans. Descriptions from camera runs are also included.

Block	Existing activity	Information summary
165/4		<p>Depth 450-800m slope to NE</p> <p>WZS G1, depth c 550m ground generally varies from dense gravel to very rocky, though included areas of relatively open sediment and what appears to be rock/ boulder piles (or ridges). Possible expression of iceberg ploughmarks. Gravel areas with little obvious fauna, some echinoids and fish. On rockier ground brittlestars may be very abundant (forming a carpet), massive sponges may also be common.</p> <p>G2 depth c480m A gravely pavement with variable cobble cover, occasional boulders, ?expression of iceberg ploughmarks. Brittlestars may be very numerous (forming a carpet). Some asteroids and echinoids present. Wire/rope strands observed.</p> <p>K depth c 520m Ground varies from Masson <i>et al.</i>, gravel/cobble pavement to very rocky; possible expression of iceberg ploughmarks. Gravel areas with very little obvious fauna. Rockier ground with sponges (massive and fan forms), octocorals, asteroids and echinoids. Some areas with dense featherstar cover (carpet forming)</p>
165/5		<p>Depth 400-1000m slope to NNE</p> <p>Likely to be similar to 165/4.</p> <p>Dead <i>Lophelia</i> taken in BGS vibrocorer</p>
165/9		<p>Depth 220-400m slope to N</p> <p>Likely to be similar to shallower parts of 165/4.</p>
165/10		<p>Depth 200-500m slope to N</p> <p>Likely to be similar to shallower parts of 165/4.</p>
166/1		<p>Depth 500-1000m slope to N</p> <p>Zone of iceberg plough marks in SW corner, contourite sand in north, rest is sand and sandy muds with occasional gravel lens.</p>
166/2		<p>Depth 400-950m slope to NNW</p>

		Sand and sandy muds with occasional gravel lens throughout
166/3		Depth 250-920m slope to NW WZS FSC800 Depth c760m Seabed of (muddy) sand with little gravel and some rocks (some rock 'aggregations'). Rocks appear to have partial sediment cover and often colonised by tubular sponges. An appreciable but not particularly well developed encrusting fauna. Cluster burrows ('fairy rings' = enteropneusts) common. Other fauna noted includes asteroids, pycnogonids, octocorals and fish (rays, rockling and lycodids) Nearly all sand and sandy muds with occasional gravel lens, patch of iceberg plough marks in SE corner
166/4		Depth 200-750m slope to NW WZS FSC500 Depth c500m Gravely sand seabed (some rippling) with some rocks (iceberg ploughmarking not apparent). Generally little obvious fauna, encrusting epifauna very poorly developed (similar to southern area of AFEN 1996 survey). Fauna noted includes close encrusting blue sponge, spider crab and fish (?Sebastes, flatfish). SSE half is Iceberg ploughmark zone, rest is sand and sandy muds with occasional gravel lens.
166/5		Depth 180-600. slope to NW WZS FSC300 Depth c260m Gravely sand with variable cobble/rock cover; possible expression of iceberg ploughmarking. Generally little obvious fauna, encrusting epifauna very poorly developed (similar to southern area of AFEN 1996 survey). Some holothurians, hermit crabs, asteroids, ceriathids and fish (<i>Helicolenus</i> , rattail, ling) noted. Numerous trawl marks observed. Nearly all is iceberg ploughmark zone, patch in NW corner of sand and sandy muds with occasional gravel lens
166/6		Depth 150-300m slope to N No direct evidence, likely to be similar to 166/5
166/7		Depth 150-300m slope to N] No direct evidence, likely to be similar to 166/5
166/8		Depth 150-300m slope to NW No direct evidence, likely to be similar to 166/5

166/9		Depth <200m No direct evidence, likely to be similar to 166/5
166/10		Depth <200m No direct evidence, likely to be similar to 166/5
175/24		Depth 500-1200m slope to S Sample RVL20 from August 2000 medium to coarse sand with stones up to 3 cm in diameter.
175/25		Depth 450-1150m slope to S WZS N1 Depth c1150m Ground varies from dense gravel cover to rock/cobble/gravel pavement, some boulders (some with comet marks). Rock/cobble areas with numerous featherstars; two species of sponges (tubular and branched tubular) also common. Fish (lycodids) frequently observed, pycnogonids and cerianthids recovered from core sample. N2 Depth c 1200m Rather featureless seafloor of sand with fine gravel cover, no rocks/cobbles observed. Lebenspurren present but little obvious fauna. Pennatulids, asteroids and fish (lycodids) observed, ophiuroids recovered from core tops. P Depth c1200m. Generally, a dense cover of fine gravel with cobbles, some rocks and the occasional boulder (some comet marks). Some open sediment patches/streaks. Sponges (massive, tubular and 'bottle-brush'), octocorals and fish (lycodids) the most evident fauna. Generally similar to N1. Sample RVL21 from August 2000 shows stones, rocks (up to 15cm) with sand and silty-clay.
175/29		Depth 500-1200m slope to N WZS J Depth c1000m Sandy seabed with no ripples and no indication of gravel or rocks K Depth c520m Ground varies from gravel/cobble pavement to very rocky; possible expression of iceberg ploughmarks. Gravel areas with very little obvious fauna. Rockier ground with sponges (massive and fan forms), octocorals, asteroids and echinoids. Some areas of dense featherstar cover (carpet forming) L Depth 1050m Sandy bottom with no obvious rippling. Gravel or rocks not generally present.
175/30		Depth 1000-1250m down and up WZS N2 Depth c 1200m Rather featureless seafloor of sand with fine gravel cover, no rocks/cobbles observed.

		Lebenspuren present but little obvious fauna. Pennatulids, asteroids and fish (lycodids) observed, ophiuroids recovered from core tops.
176/20 fragment		Depth 1000m Scarp feature in 176/25 extends into this. Sand and sandy muds with occasional gravel lens.
176/21 southern		Depth 500-1150m slope to S WZS Q Depth c1070m Seabed with very dense gravel cover and variable cobble/rock cover. Substantial bottom current flowing. Relatively abundant fauna of branched tubular sponges, featherstars and octocorals. Large anemones, pycnogonids and fish (rockling/lycodids) Most is coarse gravel with cobbles, with high current speeds and barchan sand in SE corner. Erosional scarp ?rock extends across block from 176/22. Sample RVL22#1 of 21/8/00 had 30cm stone in jaws, and evidence of other fine sediments and bedrock.
176/22 most		Depth 700-1200m slope to SE Erosional scarp, 60m high possibly outcropping volcanic basement rock (but likely to be Eocene sediments, possibly containing basalt). Most of block is coarse gravel with cobbles, with high current speeds and barchan sand in S, with sand and sandy muds in S.
176/23 most		Depth 950-1100 slope to NW Coarse gravel with cobbles in NW corner, with rest of block sand and sandy muds
176/24		Depth 900-1050m slope to NW WZS S Depth 950m Sandy sediment with little if any gravel and no rocks/cobbles. Sand and sandy muds with occasional gravel lens.
176/25		Depth 600-1000m slope to NW Erosional scarp – see TOBI image in report. Unclear if this is rock or not. Sand and sandy muds with occasional gravel lens. WTS16 Depth 954m Gravelly sediment with significant cobbles and boulders
176/26		Depth 1000-1100 bottom of trench WZS FSC1200 Depth 1130m Intriguing, strongly rippled sandy seabed. R1 Depth c1125m Generally a gravelly sand seabed with

		gravel streaks and some rocks Nearly all contourite sand, with area of sand and sandy muds with occasional gravel lens in NW.
176/27		Depth 950-1200m slope to NW WZS FSC1000 Depth 970m Sandy sediment, not rippled, with little or no gravel or rocks R2 Depth c1135m Gravely sand seabed with gravel streaks, some cobbles, some rocks with scour Nearly all sand and sandy muds with occasional gravel lens.
176/28		Depth 750-1100 slope to NW WZS FSC800 Depth c760m Seabed of (muddy) sand with little gravel and some rocks (some rock 'aggregations'). Rocks appear to have partial sediment cover and often colonised by tubular sponges. An appreciable but not particularly well developed encrusting fauna. Cluster burrows ('fairy rings' = enteropneusts) common. Other fauna noted includes asteroids, pycnogonids, octocorals and fish (rays, rockling and lycodids)
176/29		Depth 600-950m slope to NW All sand and sandy muds with occasional gravel lens.
176/30		Depth 400-800m slope to NW All sand and sandy muds with occasional gravel lens, small patch of iceberg ploughmarks in SE.
202/1		Depth 150-400m slope to NW 96C14 Medium sand 152m, 96C15 Medium sand 156m In iceberg ploughmark zone
202/2	part <i>Amerada</i>	Depth <200m No direct evidence, likely to be medium – coarse sand and in iceberg ploughmark zone
202/6	part <i>Amerada</i>	Depth <200m No direct evidence, likely to be medium – coarse sand and in iceberg ploughmark zone
202/7		Depth <200m 96C8 Coarse sand 110m In iceberg ploughmark zone
204/4		Depth 1000m+

fragment		96zone X fairly muddy with pycnogonids Sand and sandy muds with occasional gravel lenses.
204/5 most		Depth 1000m+ X3 Depth 1120. Gravely sand with cobbles and rocks (some with scour). Fauna dominated by ophiuroids and cerianthids. Other fauna noted includes asteroids, pycnogonids, octocorals and fish. Cable observed. Sand and sandy muds with occasional gravel lenses. 96zone X fairly muddy with pycnogonids FSC4 Depth 1119m Muddy sand with occasional cobbles and boulders
204/8 fragment		Depth 1000m+ 96zone X fairly muddy with pycnogonids Sand and sandy muds with occasional gravel lenses.
204/9 most		Depth 1000m+ Sand and sandy muds with occasional gravel lenses.
204/10		Depth 1000m+ X2 Depth 1050m Sandy gravel with rocks. Appreciable bottom water flow apparent. Very similar to X1. Fauna noted includes octocorals, pycnogonids, asteroids, sabellids, ceriathids, stalked sponges and fish (rockling). Sand and sandy muds with occasional gravel lenses. FSC3 Depth 1085m Muddy sand with occasional cobbles and boulders
204/12 fragment		Depth 1000m+ Sand and sandy muds with occasional gravel lenses.
204/13 most		Depth 1000m+ Sand and sandy muds with occasional gravel lenses. FSC2 Depth 1074m sand with occasional cobbles and boulders
204/14	<i>Conoco</i> Suliven oil field	Depth 700-1100m slope to NW Y1 Gravely sand with rocks and boulders (some with scour). Appreciable bottom current flowing. Similar fauna to X1 and X2. Featherstars and tubular sponge frequent. Other fauna noted includes octocorals, asteroids, gastropods, pennatulids/solitary hydroids and

		fish. Conoco 1998a, b & c, 1999 in southern parts of block indicate that seabed is covered with a thin layer of fine to coarse gravely sand up to 10 cm thick with scattered stones ranging from pebble to boulder size. Patches of fine sand larger in SW of survey area and form larger areas of sand in the west. Some sediment mounds present, some quite large – nature unknown.
204/15	<i>Conoco</i>	Depth 600-900m slope to NW X1 Gravely sand with cobbles and rocks and occasional boulders (some with scour). Fauna dominated by octocorals, featherstars and pycnogonids. Other fauna observed includes ‘bottle-brush’ sponge, asteroids and fish.
204/16 small part		Depth c1000m Sand and sandy muds with occasional gravel lenses, some channels
204/17 SE part		Depth c1000m Sand and sandy muds with occasional gravel lenses. FSC1 Depth 1019 Gravelly sediment with significant cobbles and boulders
204/18		Depth c1000m 96zone T medium gravels on level ground Sand and sandy muds with occasional gravel lenses.
204/19	part <i>BPA</i> Foinaven oil field	Depth 500-950m slope to NW BP 1999 Fine silt to relatively coarse sand. 17 sampling stations, 96T2 fine sand 592m, 96Q1 Medium sand, 525m
204/20	part <i>BPA</i> Schiehallion oil field	Depth 300-750m slope to NW BP 1997 Slope parallel sand ribbons sand cover typically 25-50% range overlying gravel. Iceberg ploughmarks, largely infilled with younger sediments. Above 400m in depth sediments mostly shelly. Cobbles in relatively small areas. No <i>Lophelia</i> found. 96M1 Medium sand 474m, 96AH Coarse sand 410m
204/21		Depth 550-1050m slope to N 96zone T medium gravels on level ground Sand and sandy muds with occasional gravel lenses.
204/22	part <i>BPA</i>	Depth 400-950m slope to N 96T3 Medium sand 773m, 96T4 Medium sand 709m, 96T5 Fine sand 675m

204/23	part <i>BPA</i>	Depth 300-600m slope to N 96Q2 Medium sand 530m, 96Q3 Fine sand 526m, 96Q4 Coarse sand 533m, 96M2 Very coarse sand 488m, 96AG2 Medium sand 362m
204/24	part <i>BPA</i> Foinaven oil field	Depth 180-600m slope to NW BP 1999 Fine silt to relatively coarse sand. 17 sampling stations. <i>Lophelia</i> on wreck., 96J3 Medium sand 350m, 96J4 Coarse sand 370m
204/25	part <i>BPA</i> , part <i>Amerada</i> Schiehallion oil field	Depth 180-500m slope to N BP1997 Slope parallel sand ribbons sand cover typically 25-50% range overlying gravel. Iceberg ploughmarks, largely infilled with younger sediments. Above 400m in depth sediments mostly shelly. Cobbles in relatively small areas. No <i>Lophelia</i> found. BP 2000 Course-fine shelly sand with occasional sandwave feature with gravel and rocks present Dead <i>Lophelia</i> found 96F1 Medium sand 232m, 96C13 Medium sand 170m
204/26	<i>Amerada</i>	Depth 150-600m slope to NW 96Q5 Medium sand 512m, 96M5 Medium sand 415m, 96J5 Coarse sand 337m
204/27	<i>Amerada</i>	Depth 150-5000m slope to N (204/28 BP env. baseline survey) 15 stations, very fine to very coarse sand, 96M3 Coarse sand 440m, 96M4 Medium sand 460m, 96F4 Medium sand 225m WTS15 Depth 492m gravelly sand
205/1		Depth 950-1000+ slope to NW 96X5 Medium silt 1080m
205/2		Depth 900-1000+ slope to NW
205/3		Depth 750-1000+ slope to NW 96V3 Fine sand 902m, 96AA7 Fine sand 726m
205/6		Depth 700-1000m, slope to NW 96V1 Medium sand 820m, 96V2 Medium sand 831m, 96S5 Coarse sand 682m
205/7		Depth 650-950m, slope to NW 96S3 Medium sand 788m, 96S4 Medium sand 764m
205/11		Depth 450-750m slope to NW

		(Esso 1996 205/14 gravely sands, increasing content of mud to north, relatively high shell content, some samples included <i>Lophelia</i> fragments), 96T1 Fine sand 741m
212/30 small part		Depth 1000m+ 96zone X fairly muddy with pycnogonids Fine grained muddy sediments
213/4 fragment		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments
213/5 SE part		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments
213/8 fragment		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments
213/9 SE part		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments
213/10		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments FSC8 Depth 1500m sandy mud.
213/12 fragment		Depth 1000m+ 96zoneY Thin muddy sand over clay Fine grained muddy sediments
213/13 SE part		Depth 1000m+ 96zoneY Thin muddy sand over clay Fine grained muddy sediments
213/14		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments FSC7 Depth 1386m Muddy sand with significant cobbles and boulders
213/15		Depth 1000m+ 96zoneZ Thin muddy sand over clay Fine grained muddy sediments

213/16 fragment		Depth 1000m+ 96zone X fairly muddy with pycnogonids Fine grained muddy sediments
213/17 SE part		Depth 1000m+ 96zone X fairly muddy with pycnogonids Fine grained muddy sediments FSC6 Depth 1138m Gravelly muddy sand with significant cobbles and boulders
213/18	<i>Mobil</i>	Depth 1000m+ Fine grained muddy sediments
213/19	<i>Mobil</i>	Depth 1000m+ Fine grained muddy sediments
213/20	<i>Mobil</i>	Depth 1000m+ Fine grained muddy sediments
213/21 SE part		Depth 1000m+ Fine grained muddy sediments FSC5 Depth 1090m Muddy sand with significant cobbles and boulders
213/22		Depth 1000m+ Fine grained muddy sediments
213/23	<i>Mobil</i>	Depth 1000m+ Depth 1215m Mobil 1997 Very soft brown, slightly sandy clay Fine grained muddy sediments
213/24	<i>Mobil</i>	Depth 1000m+ Depth 1215m Mobil 1997 Very soft brown, slightly sandy clay Fine grained muddy sediments
213/26 most		Depth 1000m+ 96zone X fairly muddy with pycnogonids Fine grained muddy sediments
213/27		Depth 1000m+ 96zone X fairly muddy with pycnogonids Fine grained muddy sediments
213/28	<i>Conoco</i>	Depth 1000m+ Fine grained muddy sediments

213/29	<i>Conoco</i>	Depth 1000m+ Fine grained muddy sediments
214/1		Depth 1000m+ Fine grained muddy sediments FSC9 Depth 1617m sandy mud.
214/2	<i>Phillips</i>	Depth 1000m+ Fine grained muddy sediments
214/3	<i>Phillips</i>	Depth 1000m+ (Mobil 1998 214/4 Soft bottom clays) Fine grained muddy sediments
214/6 N half	part <i>Phillips</i>	Depth 1000m+ Fine grained muddy sediments
214/7	<i>Phillips</i>	Depth 1000m+ Fine grained muddy sediments
214/8	<i>Phillips</i>	Depth 1000m+ Fine grained muddy sediments
214/11	<i>Mobil</i>	Depth 1000m+ Fine grained muddy sediments
214/12	<i>Mobil</i>	Depth 1000m+ Fine grained muddy sediments
214/16	<i>Mobil</i>	Depth 1000m+ (Mobil 1997 214/17 1200m very soft to soft clays. Mounds with average height of 1.2m Possible explanations include sediment dumps from icebergs, bioherms or mud volcano/fluid escape features. Sediment dump unlikely, no sign of bioherm from coring, so most likely fluid escape features. Fine grained muddy sediments
215/30		Depth 1000m+ Fine grained muddy sediments
216/25		Depth 1000m+ Fine grained muddy sediments
216/26		Depth 1000m+ Fine grained muddy sediments

Source material

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- BP 1998 Potential pipeline routes from Clair field to Sullom Voe (Shetland) and Flotta (Orkney) terminals – Preliminary Environmental Impact Assessment
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