

BP006365



BP PETROLEUM DEVELOPMENT LTD. NORWAY

GEOLOGICAL COMPLETION REPORT

WELL 16/8-2

August 1980

16/8-2 W28

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BP PETROLEUM DEVELOPMENT LTD., NORWAY U/A

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August 1980

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Author: J.D. Roseway

Approved: A.M. Spencer

BP PETROLEUM DEVELOPMENT OF NORWAY A.S.

LOCATION PLAT 16/8-2

COUNTRY - NORWAY

LICENCE NO. 02Q

AREA - NORTH SEA

BLOCK NO. 16/8

COORDINATES - LAT. $58^{\circ}20'59.81''$ N

GRID REFERENCE 6467967.70N

LONG. $02^{\circ}24'59.58''$ E

465848.40E

ELEVATION OF ROTARY TABLE 29.9

metres AMSL

REFERENCE - UTM INTERNATIONAL SPHEROID, ZONE 31

Scale: 1:250,000

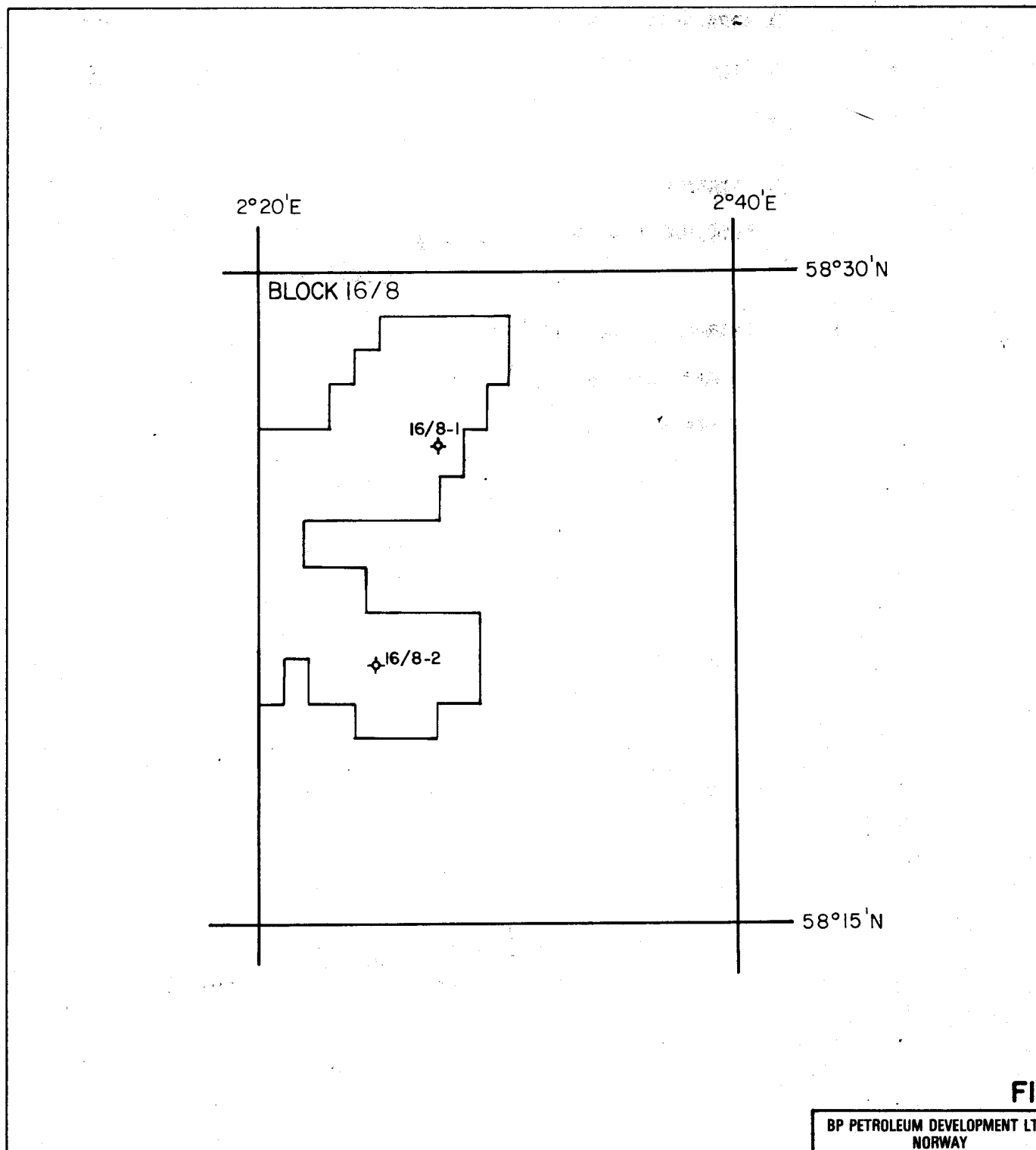


FIG. 1

BP PETROLEUM DEVELOPMENT LTD.
NORWAY

Ref: 16/8-2 W 28

Author: J. D. ROSEWAY

Date: AUG. 1980 Drg No: 4151

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2. 1:10,000 Summarised Well Log

Enclosures

1. Composite Well Log 1:500

2. Contractors Mud Log 1:500

3. Litholog 1:500

revised 25/11/80 following
receipt of final biostrat. report.

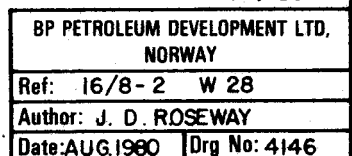
SUMMARY

The first objective of NOCS well 16/8-2 was Upper Jurassic sandstones in a structure with dip closure against a sealing fault mapped at the Red Horizon (Base Cretaceous). The second objective was possible Rotliegendes or Devonian sandstones in an independent faulted domal structure mapped at the Purple horizon (Base Zechstein evaporites). Secondary objectives were possible fractured limestones in a simple dip closed structure at the Yellow Horizon (Base Tertiary) and Triassic sandstones within closure of the trap mentioned above for the Upper Jurassic.

The well was spudded on April 3rd 1980. It penetrated a predominantly argillaceous Palaeogene section. The Lower Palaeocene and Upper Cretaceous limestones are water-bearing. Lower Cretaceous mudstones are well-developed and underlain by a thin section of Upper Jurassic mudstones. The Upper Jurassic sand section is 15 m thick, but contains only 5.5 m of reservoir quality sandstones, which are not hydrocarbon-bearing. The Triassic is absent at this location. A thin Upper Permian mudstone is present above a thick evaporite sequence.

The well was terminated in Zechstein evaporites at 3585 m without penetrating the lower target, owing to mechanical problems.

LOCATION: 58°20'59.81"N
02°24'59.58"E



WELL 16/8-2 NOCS NORTH SEA

LATITUDE: 58°20'59.81"N

LONGITUDE: 02°24'59.58"E

OPERATOR: BP PET DEV LTD., NORWAY

RTE: 29.9 m.a.m.s.l

102.53 a.s.b.

WATER DEPTH: 72.63 m

RIG: Semisubmersible

NAME: SEDCO H

OBJECTIVES: Sandstone reservoirs in Upper Jurassic and Lower Permian (Rotliegendes) sequences

DATE SPUDDED: April 3rd 1980

DATE COMPLETED: August 13th 1980

DEPTH: 3585 m.brt, 3555.1 mss.

WELL STATUS: Plugged and abandoned, dry

GEOLOGICAL DATA

Lithostratigraphy

	<u>Tops</u>		<u>Thickness</u>
	m.brt	mss	
Nordland Gp	102.5	72.6	1151.5
Hordaland Gp	1254	1224.1	274
Rogaland Gp	1528	1498.1	97
Balder Fm	1528	1498.1	43
Sele Fm	1571	1541.1	54
Montrose Gp	1625	1595.1	127
Lista Fm	1625	1595.1	127
Chalk Gp	1752	1722.1	148
Ekofisk Fm	1752	1722.1	11
Tor Fm	1763	1733	87
Hod Fm	1850	1820.1	50
Cromer Knoll Group	1900	1870.1	287
Rødby Fm	1900	1870.1	119
Valhall Fm	2019	1989.1	168
Humber Gp	2187	2157.1	63.5
Kimmeridge Clay Fm	2187	2157.1	52
Formation Z	2239	2209.1	11.5
Zechstein Gp	2254	2224.1	1131+

CHRONOSTRATIGRAPHY (BP Sunbury

	<u>Depth of highest identified samples</u>		<u>Thickness</u>
	mDD	mSS	
Tertiary to Recent	102.5	72.6	1697.5
Plio-Pleistocene	250	220.1	600.0
Miocene	850	820.1	250.0
Oligocene	1100	1070.1	300.0
Eocene	1400	1370.1	321.0
Palaeocene - Early	1721	1691.1	79.0
Cretaceous - Late	1800	1770.1	100.0
Maastrichtian	1800	1770.1	50.0
Earliest Maastrichtian to Campanian to ?Comacian	1850	1820.1	50.0
Cretaceous - Early	1900	1870.1	348.0
Albian	1900	1870.1	45.0
Aptian	1945	1915.1	40.0
Barremian	1985	1955.1	90.0
Hauterivian	2075	2035.1	55.0
Valanginian	2130	2100.1	30.0
Berriasian - Late	2190	2160.1	60.0
Oxfordian	2245	2215.1	6.0
Permian - Late	2254	2224.1	1131+

CORES No full-hole cores were cut. 50 sidewall cores were attempted between 2286 to 1950 m, of which 40 were recovered.

SHOWS No shows were recorded.

COMMENTS 15 m of the Upper Jurassic sand unit were penetrated with only 5.5 m of reservoir quality sandstones. They were water-bearing. The well was abandoned before penetrating the base of the Zechstein evaporite sequence, owing to mechanical problems. The original hole had been drilled to 3519 m and was sidetracked at 2325 m brt.

REPORT REFERENCE: BP Norway 16/8-2 W28

AUTHOR: J.D. ROSEWAY

DATE: September 1980

3. SAMPLES AND SAMPLING INTERVALS

(a) Ditch Cuttings Samples

200 to 1600 m, 2340 to 3180	10 m interval
1600 to 2190 m, 2288 to 2340 m and 3180 to 3570 m	5 m interval
2190 to 2288 m, 3570 to 3585	3 m interval

(b) Sidewall cores

Attempted	50
Misfires	2
Lost	5
Empty	3
Recovered	40

(c) Full hole cores

No full hole cores were taken.

4. GEOLOGY

This report follows the lithostratigraphic nomenclature of Deegan and Scull (1977), using the present BP Norway interpretation for the Tertiary and Cretaceous (Drake 1979) and Jurassic (James 1979).

Nordland Group (102.5 - 1254m) -- Oligocene to Recent

No samples were collected from seabed down to 200 m. From that depth to 405 m the section comprises loose sands, with abundant shell fragments and lignitic carbonaceous material. The sands are colourless, occasionally white, orange and pink, fine to coarse grained, predominantly fine, subrounded to subangular, quartzose. A sequence of light grey, soft, silty, calcareous mudstones were penetrated down to 806 m. Between this depth and 974 m are a series of thick, clean sandstones with occasional mudstones and rare siltstone interbeds. The sandstones are colourless occasionally white, fine to medium grained, subrounded to rounded, loose, quartzose with abundant shell fragments and become very glauconitic downwards. The intervening mudstones are light to medium grey, soft, slightly calcareous and green grey, firm, blocky, glauconitic, silty, non calcareous. The siltstones are grey brown to brown, firm, argillaceous, blocky and slightly calcareous. The remainder of the group down to 1254 m is predominantly brown, soft to firm, micromicaceous, very silty slightly calcareous mudstones with occasional beds of sandstones similar to those described above.

Hordaland Group (1254 to 1528 m) - Eocene to Oligocene

The top of this group is picked at an upward decrease in sonic transit time, and increase in resistivity. A change in lithology occurs to vari-coloured mudstones, with common thin limestones and sandstones.

The mudstones are interbedded green to grey, red brown, grey to brown, soft to firm, silty to very silty, occasionally glauconitic and non to slightly calcareous. The limestones are off white to orange brown, hard, dolomitic, microcrystalline and the sandstones contain colourless quartz and green glauconite grains, fine to medium, subrounded, loose with abundant shell fragments.

A distinctive bright red, soft, very calcareous mudstone bed occurs near the base of the group.

Rogaland Group (1528 to 1625 m) - Eocene

This group is divided into the tuffaceous Balder Formation and argillaceous Sele Formation.

Balder Formation (1528 to 1571 m) - Eocene

The top is defined by the dramatic decrease in sonic transit time with depth and accompanying increases in gamma ray and resistivity values.

This formation is composed of interbedded mudstones, brown, and pale grey to grey green, soft to firm, blocky, very silty, non calcareous, occ glauconitic with minor tuff, which is grey, speckled white, firm, pyritic, occasionally sandy, siltstone texture. Stringers of limestone, orange-brown, clear, hard, crystalline and sandstone, colourless, very fine to medium grained, subangular, quartzose, loose are also present.

Sele Formation (1571 to 1625 m) - Eocene

The top occurs at the base of the characteristic 'barrel-shape' log response of the overlying formation producing an upward decrease in transit time and gamma ray values.

Lithologically, it comprises interbedded mudstones which are light grey-green, firm, blocky, occasionally glauconitic, non-calcareous, and brown to green, soft to firm, very silty, micaceous, occasionally glauconitic, non-calcareous. Thin limestones, off-white to light brown, firm to hard, crystalline are encountered.

Montrose Group (1625 to 1752 m) - Palaeocene

The argillaceous Lista Formation alone is encountered at this location.

Lista Formation (1625 to 1752 m) - Palaeocene

The top of this formation is poorly defined in this well, as only the gamma ray (through casing) was run over this interval. The top is taken at a slight upward increase in gamma ray values. This interval comprises similar interbedded mudstones to those described for the overlying formation.

Chalk Group (1752 to 1900 m)

Calcareous mudstones of the Ekofisk Formation are developed at this location. They are transitional from the non calcareous Montrose Group mudstones to the underlying limestones of the Tor and Hod Formations which complete the Chalk Group sequence.

Ekofisk Formation (1752 to 1763 m) - Palaeocene

This formation comprises dark grey, calcareous mudstones that grade down into limestones as described below. The top is placed above a limestone bed that is off white to pale grey, soft, mudstone texture, at which point, gamma ray and transit time values decrease, and continue to decrease downwards through the formation.

Cretaceous

Tor Formation (1763 to 1850 m) - Maastrichtian to Early Palaeocene

The boundary with the overlying Ekofisk Formation is defined at the top of a unit with relatively constant low gamma ray and transit time response. Lithologically, the formation is predominantly composed of limestones which are white to off-white, firm to hard, mudstone texture, becoming occasionally pink downwards with chert nodules. Mudstones, dark grey, firm to hard, blocky, non to slightly calcareous, occur rarely.

Hod Formation (1850 to 1900 m) - ?Coniacian to Early Maastrichtian

This formation is distinguished from the one above by a slightly higher gamma ray response, and more constant resistivity and sonic transit time values. It consists of limestones similar to those described above, which become increasingly glauconitic and sandy downwards, with black carbonaceous flecks as well.

Cromer Knoll Group (1900 to 2187 m) - Valanginian to Albian

The calcareous mudstones, siltstones and sandstones of this group are divided into the Rødby and Valhall Formations.

Rødby Formation (1900 to 2019 m) - Barremian to Albian

The top is marked by a sharp upward decrease in gamma ray and transit time values passing into the limestones of the Chalk Group.

The section down to 1896 m comprises sandstones and siltstones. The

sandstones are light grey green, very fine to fine grained, subrounded, quartzose, very glauconitic, occasionally pyritic, very friable with calcareous cement, which interbed and intergrade with siltstones, light brown grey, soft, very calcareous, sandy, argillaceous, micaceous, slightly carbonaceous, slightly glauconitic and slightly pyritic. These lithologies recur within the varicoloured mudstone sequence below.

These mudstones are dark grey to dark grey brown, soft to firm, blocky micromicaceous, occasionally very silty and sandy, calcareous, and also red-brown, firm to hard, subfissile, occasionally pyritic, micromicaceous and very calcareous.

Valhall Formation (2019 - 2187 m) - Valanginian to Hauterivian

The boundary with the overlying formation is placed at the top of a section with relatively constant gamma ray response. The lithological change is not major, the formation comprises mudstones which are grey to dark grey, firm, occasionally sandy and very silty, slightly glauconitic and carbonaceous and pyritic, and very calcareous. They are interbedded towards the base with mudstone, light grey brown, silty, micromicaceous, occasionally sandy and pyritic, very calcareous, and mudstones, red-brown orange-brown, firm to hard, blocky to subfissile, silty, very calcareous.

Jurassic

Kimmeridge Clay Formation (2187 to 2239 m) - Late Berriasian

The top of this formation is marked by a sharp decrease in sonic transit time. The high gamma ray values are also characteristic of this formation. It consists of mudstones, which are grey brown to brown, firm to hard, subfissile, pyritic, micaceous, carbonaceous, with occasional silty streaks, slightly calcareous, becoming dolomitic downwards. Towards the base are two prominent limestone beds, white, off white, argillaceous, pyritic, hard, mudstone texture.

Formation Z (2239.5 to 2254 m) - Oxfordian

The top is defined where transit time values increase upwards markedly with an accompanying increase in gamma ray values. The formation is composed of mudstones, dark brown, firm to hard, slightly dolomitic, pyritic, carbonaceous, occasionally micaceous and silty and sandy, grading to and interbedded with sandstone, light to dark grey brown, very fine to fine grained, moderately sorted, subangular, hard, with calcareous cement

and argillaceous infill, micaceous, pyritic, carbonaceous, glauconitic.

Between 2246.0 and 2251.5 m is a clean sandstone, light grey, fine to medium grained, subrounded, well sorted, friable, dolomitic, pyritic, glauconitic, grainstone texture.

Zechstein Group (2254 - 2261 m) - Late Permian

This group commences with an undifferentiated interval of mudstones down to 2261 m. They are grey, grey brown, firm, micaceous, occasionally silty and slightly calcareous. The upper boundary is marked on electric logs by a higher transit time than the overlying formation.

Below 2261 m, a thick evaporite sequence was penetrated. The anhydrite at the top is white to off-white, soft to firm, mudstone texture, with the characteristic very low gamma ray and transit time values. Below 2286 m a monotonous halite sequence is developed, which is colourless and clear, occasionally pale orange to milky and translucent, hard, crystalline, with minor anhydrite, white, firm to hard, crystalline. In the intervals 3185 to 3210 m and 3462 to 3474 m, interbedded dolomites, anhydrites, and mudstones (inferred from electric logs only) are present. The dolomites are brown to brown grey, very hard, sucrosic, and occasionally dark brown, argillaceous, mudstone texture. Between 3219 and 3233 m, and 3475 and 3480 m, the presence of carnallite is indicated by electric log properties and cation analyses of mud returns. From 3575 m to TD, a dolomite sequence was penetrated, cream, and pale to dark grey brown mottled, laminated, variably argillaceous, calcitic streaks, anhydritic, pyritic, slightly carbonaceous, microcrystalline to mudstone texture.

5. WELL 16/8-2 SIDEWALL CORE DESCRIPTIONS

<u>No.</u>	<u>DEPTH(mbrc)</u> ↓?	<u>LITHOLOGY</u>
1	2286	HALITE, white, colourless, orange, translucent, hard, crystalline.
2	2284	ANHYDRITE, white, off-white, soft to firm, mudstone texture.
3	2267	ANHYDRITE, as above.
4	2265	ANHYDRITE, as above.
5	2263	ANHYDRITE, as above.
6	2254	MUDSTONE, grey, grey-brown, firm occ soft, slightly calcareous, occ silty, micaceous, sticky.
7	2253	MUDSTONE, grey, grey-brown, firm, occ soft, slightly to moderately calcareous, occ silty, micaceous, sticky, occ very sandy.
8	2250	MISFIRE
9	2249	SANDSTONE, colourless, light grey, fine to medium, rounded to subrounded, moderate sphericity, well sorted, quartzose, very friable, good visual porosity, grainstone texture, no shows.
10	2248	SANDSTONE, colourless, light grey, occ pink, translucent, fine- to medium - grained, sub-rounded, well sorted, quartzose, glauconitic, friable, grainstone, no shows.
11	2246	MISFIRE.
12	2236	MUDSTONE, dark grey, dark brown, firm, subfissile, micaceous, occ silty, calcareous.
13	2235	MUDSTONE, dark grey, dark brown, firm to hard, subfissile, micaceous, silty, slightly to non-calcareous.
14	2233	MUDSTONE, dark grey, dark brown, firm, non-calcareous, as above.
15	2231	MUDSTONE, dark grey, dark brown, hard, brittle, subfissile, micaceous, silty, non-calcareous and MUDSTONE, light grey, light brown, very soft to firm, carbonaceous flecks, occ sandy, silty, micaceous, very calcareous
16	2230	EMPTY
17	2227	EMPTY

18	2196	MUDSTONE, grey brown, firm to hard, occ soft, carbonaceous, micaceous, silty, occ sandy, slightly to moderately calcareous.
19	2191	MUDSTONE, grey, grey brown, firm to hard, subfissile, micaceous, silty, pyritic, moderately calcareous.
20	2185	SILTSTONE, light grey, soft to firm, disseminated pyrite, micaceous, occ sandy, moderately calcareous.
21	2182	MUDSTONE, light grey, soft to firm, silty non to slightly calcareous, and MUDSTONE, red brown, orange brown, firm to hard, blocky, occ subfissile, silty, moderately to very calcareous.
22	2158	MUDSTONE, red brown, orange brown, firm to hard, occ subfiss, blocky, silty, calcareous and MUDSTONE, light brown grey, buff, firm, silty, occ sandy, micromicaceous, occ pyritic, very calcareous and MUDSTONE, dark grey, occ dark grey brown, hard to very hard, occ brittle, silty, occ pyritic, non calc.
23	2140	MUDSTONE, grey, occ light grey, firm blocky to subfissile, micaceous, occ pyritic, very calcareous.
24	2130	MUDSTONE, light grey, rarely light brown, soft to firm, sandy, micaceous, pyritic, sandy, occ silty.
25	2075	MUDSTONE, grey, occ dark grey, firm, blocky to occ subfissile, micromicaceous, slightly silty, occ sandy, slightly pyritic, very calcareous.
26	2050	LOST
27	2024	MUDSTONE, grey, occ dark grey, firm, occ hard, as above.
28	2007	MUDSTONE, dark grey, occ dark grey brown, firm to occ hard, micaceous, silty, very calcareous.
29	1980	LOST
30	1965	MUDSTONE, red-brown, brown, firm to hard, occ subfissile, micromic, occ pyritic, very calcareous.
31	1960	EMPTY
32	1950	MUDSTONE, red brown, brown, firm to hard, micromicaceous, occ pyritic, very calcareous and MUDSTONE, light grey, firm occ soft, carbonaceous, micromicaceous, pyritic, occ subfissile, very calcareous.

33	1937	LOST
34	1901	SANDSTONE, light grey green, very fine, occ fine-grained, translucent quartz (colourless), and glauconite (green), subrounded, moderate sphericity well sorted, occ pyritic, very friable, calcareous cement, moderate visual porosity, grainstone texture, occ grading to SILTSTONE.
35	1900	SANDSTONE, lt grey green grading to SILTSTONE as above.
36	1889	LIMESTONE, off white, pale grey, soft, slightly glauconitic, slightly pyritic, mudstone texture.
37	1850	LIMESTONE, white, off white, pink, firm, mudstone texture.
38	1825	LIMESTONE, pink, occ off-white, firm to hard, microcrystalline, sucrosic texture.
39	1800	LIMESTONE, white, off-white, firm to hard, mudstone texture, occ microcrystalline, sucrosic texture.
40	1795	LIMESTONE, white off-white, firm, occ hard, cryptocrystalline.
41	1782	LIMESTONE, white, occ off-white, firm, occ hard, mudstone texture.
42	1775	LIMESTONE, white occ off-white, firm, occ hard, mudstone texture.
43	1753	LIMESTONE, white, occ off-white, firm occ hard, mudstone texture.
44	1752	LOST
45	1751	MUDSTONE, dark grey, firm to hard, subfissile, occ plastic, micromicaceous, occ carbonaceous flecks, non-calcareous.
46	1748	MUDSTONE, dark grey, grey, firm to hard, blocky occ subfissile, micromicaceous non-calcareous.
47	1744	MUDSTONE, grey occ dark grey, firm to hard, subfissile, occ blocky, micromicaceous, slightly calcareous.
48	1725	MUDSTONE, grey, dark grey, firm to hard, blocky occ subfissile, micromicaceous, non-calcareous.
49	1721	MUDSTONE, grey, occ light to dark grey, soft to firm, sticky, carbonaceous flecks, micromicaceous non calcareous, and minor LIMESTONE, pale grey, hard, microcrystalline, sucrosic texture.
50	1707	LOST

6. WIRELINE LOGS

Run No.	Log	Date	Hole Size	Depth logged
1A	BHC Acoustic/IEL	9/4/80	24"	50 - 539
2B	" "	19/4/80	17½"	534 - 1622
3BC	" "	9/5/80	12 1/4"	1500 - 2287
4A	Temperature Log	11/5/80	9 5/8" csg	100 - 1100
5A D	BHC Acoustic	13/7/80	8½"	2220 - 3478
5A	DLL/MLL	13/7/80	8½"	3150 - 3482
6B	Temperature Log	16/7/80	7" liner	2035 - 3225

CONSULT P.E. DEPT. NEXT TIME !

(They'll tell you they don't know and V.S.O.
will have to check up and find out what
you'll see then).

7. REFERENCES

- Deegan, C.E. & Scull, B.J. 1977. A standard lithostratigraphic nomenclature for the Central and Northern North Sea GL/NO/098.
- Drake, S.J. 1979. Stratigraphy of the Cretaceous and Early Palaeogene of the Norwegian North Sea, South of 59°N. GL/NO/270.
- James, R.A: 1979. Jurassic stratigraphy and Reservoir Potential of the Norwegian North Sea, South of 59°N. GL/NO/272.