

ROBERTSON RESEARCH COMPANY LIMITED

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OILFIELDS REPORT NO. 419

THE MICROPALAEONTOLOGY AND STRATIGRAPHY

OF THE PHILLIPS (NORWAY) 2/4-5X

NORTH SEA WELL

CL 72

by

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Micropalaeontological Analysis Charts Nos. 1 - 11.

Biostratigraphic Chart showing the distribution of the diagnostic Tertiary and Cretaceous Foraminifera in the Phillips (Norway) 2/4-5X North Sea Well. (2 Sheets).

INTRODUCTION

This report summarises the results of the micropalaeontological and stratigraphical analyses which have been carried out under Project No. ARP 701/2636 on material received from the interval 1970' - 11100' of the Phillips (Norway) 2/4-5X North Sea Well.

This exploration well was the sixth drilled in block 2/4 of the Norwegian North Sea Concession Area.

A thick, almost complete Tertiary sequence overlies Chalk of Danian and Maestrichtian - ?Campanian age, the well reached T.D. in Maestrichtian - ?Campanian Chalk.

We wish to acknowledge the continued co-operation and assistance received from the various members of the Phillips Petroleum Company with whom we have been associated during the course of this work.

A summary of the succession encountered may be found in Table I, overleaf.

II

SUCCESIONTABLE I

<u>UNIT</u>	<u>INTERVAL</u>	<u>THICKNESS</u>	<u>STAGE</u>	<u>SYSTEM/SUBSYSTEM</u>
A	1970' - 2000'	+ 30'	Scaldisian	Upper Pliocene
B	2030' - 2400'	+ 370'	Upper Diestian	Lower Pliocene
C	2430' - 2940'	+ 510'	Lower Diestian	Upper Miocene
D	2970' - 5240'	+ 2270'	-	Middle Miocene
E	5270' - 5350'	+ 80'	?Burdigalian	?Lower Miocene
F	5370' - 5470'	+ 100'	Burdigalian	Lower Miocene
G	5490' - 5830'	+ 340'	Aquitanian	Lower Miocene
H	5850' - 6190'	+ 340'	-	Lower Miocene-Oligocene
I	6210' - 7890'	+ 1680'	-	Oligocene
J	7910' - 8210'	+ 300'	-	Oligocene-?Eocene
K	8230' - 9050'	+ 820'	-	Eocene
L	9070' - 9670'	+ 600'	-	Lower Eocene-Palaeocene
M	9690' - 9830'	+ 140'	-	Palaeocene
N	9850' - 10130'	+ 280'	?Danian	?Lower Palaeocene
O	10150' - 10670'	+ 520'	Danian	Lower Palaeocene
P	10690' - 11100'	+ 410'	Maestrichtian- ?Campanian	Upper Cretaceous

III

MATERIALS AND METHODS

Under Project No. ARP 701/2636 a total of 408 ditch cutting samples, together with 102 core-pieces, were analysed using standard micropalaeontological techniques.

A summary of the information obtained from these samples was forwarded in a series of telex and telephone communications. These contain the framework of factual information on which this report is based. The prepared slides and recorded information are now filed and curated in the confidential records section of these laboratories. The methods of treating and assessing the age of the samples are similar to those mentioned in earlier Oilfields Reports.

IV

TERTIARY

(a) Pliocene

UNIT A, INTERVAL 1970' - 2000'; Scaldisian, Upper Pliocene

General Lithology

The two samples from this unit are contaminated with cement, but they appear to contain pyritic clays with fine to coarse-grained, angular to rounded, unconsolidated sand and pebble fragments. Small amounts of bivalve debris are also present.

Micropalaeontology and Stratigraphical Conclusions

The two samples of this section contain moderate faunas of calcareous benthic foraminifera, including the following forms:

Cassidulina laevigata

Cassidulina oblonga

Cassidulina subglobosa

Cibicides scaldisiensis

Uvigerina asperula

This assemblage indicates that the unit is Scaldisian, Upper Pliocene, in age. Species of Cassidulina, Cibicides and Nonion dominate the assemblages.

UNIT B, INTERVAL 2030' - 2400'; Upper Diestian, Lower Pliocene

General Lithology

Buff to light grey, calcareous clays are interbedded with a little poorly sorted, friable, pyritic sandstone in this interval. The clays are occasionally glauconitic and contain bivalve debris at certain horizons.

Micropalaeontology and Stratigraphical Conclusions

The incoming of Bulimina elongata var. subulata and Bulimina elongata var. tenera at 2030' is taken to indicate that Upper Diestian, i.e. Lower Pliocene, sediments have been penetrated. Cassidulina spp. and Nonion spp. continue to dominate the assemblages of this section. Reworked older Tertiary forms are also recorded within the unit.

(b) Miocene

UNIT C, INTERVAL 2430' - 2940'; Lower Diestian, Upper Miocene

General Lithology

The sequence is very similar to the overlying interval and consists predominantly of light grey, pyritic, calcareous, fossiliferous clays containing subordinate amounts of fine to medium-grained sands which are composed of clear to amber or green quartz grains. Coarse, well rounded sand grains occur at the top of the unit, at 2430'. Traces of buff-coloured limestones are observed from 2910' down to the base of the section and may represent very thin intercalations.

Micropalaeontology and Stratigraphical Conclusions

This rich assemblage which occurs at 2430' contains several new forms, including Sigmoilina celata and Rotalia beccarii var., and suggests that Lower Diestian, i.e. Upper Miocene, rocks have been encountered. Many reworked older Tertiary forms occur in this top sample of the unit. Species of Bulimina become common for the first time within this section, and together with Cassidulina spp. and Elphidium spp., form the major elements of the assemblages.

UNIT D, INTERVAL 2970' - 5240'; Middle Miocene

General Lithology

This interval consists essentially of soft, buff to light grey, pyritic, calcareous, fossiliferous, locally glauconitic, clays. They are associated with thin beds of buff to brown, slightly calcareous shales; greenish-grey, micaceous,

silty shales; and occasional developments of red, micaceous, dark brown, sandy shales. A little buff to reddish-brown, cryptocrystalline to micro-crystalline, locally carbonaceous limestone persists throughout the interval, while a buff, cryptocrystalline dolomite occurs in small amounts below 4690'.

Micropalaeontology and Stratigraphical Conclusions

Moderate to rich microfaunas have been obtained from the samples of this interval thus enabling the following sub-divisions to be recognised:-

INTERVAL 2970' - 3850'

The appearance of Loxostomum sinuosum, Globigerina cf. angustiumbilicata and Pyrgo bulloides at 2970' demonstrates the Middle Miocene age of this unit. The initial samples are poorly fossiliferous, however, at 3030' a rich fauna occurs and similar faunas characterise the remainder of the interval. Uvigerina asperula is common below 3330' with rare specimens of Uvigerina hosiusi at 3520' and in several of the lower samples.

INTERVAL 3880' - 4720'

At 3880', Uvigerina hosiusi becomes common for the first time and remains an important element of the fauna during this interval. Rich faunas are found in the upper part of the unit (3880' - 4210') but they moderate in the lower section.

INTERVAL 4750' - 5310'

The top of this is marked by an overall decrease in fauna, however, there is an increase in the proportion of arenaceous foraminifera present. Bathysiphon dubia is very common at 4940' and Glomospira charoides is the dominant form at 5150'. Planktonic foraminifera increase in numbers towards the base of the unit.

INTERVAL 5240'

The single sample of this unit contains large numbers of very small planktonic foraminifera.

UNIT E, INTERVAL 5270' - 5350'; ?Burdigalian, ?Lower Miocene

General Lithology

The upper part of this unit, from 5270' to 5300', resembles the overlying beds and consists of pyritic, calcareous clays with thin beds of buff, cryptocrystalline dolomite. Below 5330' the samples are heavily contaminated with cement, but the interval appears to be made up of interbedded clays and light greenish-grey, slightly calcareous shales.

Micropalaeontology and Stratigraphical Conclusions

The appearance of Uvigerina cf. tenuipustulata and Angulogerina cf. gracilis var. tenuistriata at the top of this interval may suggest that Lower Miocene sediments have been encountered. As there is no conclusive evidence, an age determination of ?Burdigalian, ?Lower Miocene is proposed for the unit.

UNIT F, INTERVAL 5370' - 5470'; Burdigalian, Lower Miocene

General Lithology

The upper 50' of this unit consists of pyritic clays with thin beds of light greyish-green, sucrosic dolomite. The lower part of the interval (5440' - 5470') is characterised by slightly arenaceous shales.

Micropalaeontology and Stratigraphical Conclusions

The incoming of Uvigerina tenuipustulata and Ehrenbergina serrata at 5370', followed by Globorotalia aff. fohsi barisanensis at 5420' would indicate that the sediments of this interval are Burdigalian, Lower Miocene, in age.

UNIT G, INTERVAL 5490' - 5830'; Aquitanian, Lower Miocene

General Lithology

This unit comprises for the most part grey clays with thin intercalations of buff to grey, fissile shales and buff, carbonaceous, cryptocrystalline limestones and dolomites. A bed of greenish-grey, sucrosic dolomite is prominent at 5590'.

Micropalaeontology and Stratigraphical Conclusions

A new planktonic assemblage is recorded at 5490' and includes Globigerinoides bisphericus, Orbulina suturalis and Porticulasphaera transitoria. This assemblage suggests an Aquitanian, i.e. Lower Miocene, age for the interval, a determination later confirmed by the occurrence of Globorotalia scitula praescitula at 5670'. The interval is characterised by rich faunas with many well preserved Globigerinoides spp. and common Globorotalia spp.

(c) Miocene-Oligocene

UNIT H, INTERVAL 5850' - 6190'; Lower Miocene - Oligocene

General Lithology

This unit is lithologically similar to the overlying interval and is composed of an interbedded sequence of clays; buff to grey or brown, slightly calcareous shales; and buff, occasionally carbonaceous dolomite. Some of the clays in the interval are slightly arenaceous.

Micropalaeontology and Stratigraphical Conclusions

An assemblage which has Oligocene affinities appears at 5850', including such forms as Eponides cf. pygmeus and Uvigerina cf. rugulosa, with Alabamina aff. perlata following at 5910'. However, the majority of the forms present in each assemblage is still composed of Lower Miocene fossils, hence a determination of Lower Miocene - Oligocene is suggested for this unit.

(d) Oligocene

UNIT I, INTERVAL 6210' - 7890'; Oligocene

General Lithology

The greater part of this interval consists of clays with a little interbedded brown, soft, fissile, occasionally calcareous shale. Thin beds of buff to brown, frequently sandy dolomites and thicker beds of buff or brown, pyritic, micro-crystalline to cryptocrystalline, locally sandy, carbonaceous limestones also occur.

Micropalaeontology and Stratigraphical Conclusions

An influx of new forms is noted at the top of this interval, including Asterigerina gürichi, Gyroldina girardana and Cibicides tenellus, indicating the presence of Oligocene sediments at this level. Planktonic foraminifera are common in the upper part of the unit, but below 6610' arenaceous foraminifera become the dominant forms, with Sigmoilina spp. being particularly common at 7270'. Bathysiphon dubia and Ammodiscus incertus are very common in the sample at 7850'. ?Rotaliatina bulimoides is recorded from the underlying unit and has presumably caved from the Oligocene section.

(e) Oligocene-Eocene

UNIT J, INTERVAL 7910' - 8210'; Oligocene - ?Eocene

General Lithology

This interval resembles the overlying unit and comprises clays, some of which are arenaceous, together with thin beds of brown, micaceous shale; buff to brown, cryptocrystalline limestone; and brown dolomite. Bivalve fragments are present throughout the interval.

Micropalaeontology and Stratigraphical Conclusions

Possible Eocene sediments are indicated by the incoming of Globigerina cf. eocaena, Trochammina globigeriniformis and Bathysiphon cf. eocenicus at 7910'. The absence of more positive evidence and the incoming of ?Rotaliatina bulimoides leads to an Oligocene - ?Eocene age determination being assigned to the interval.

(f) Eocene

UNIT K, INTERVAL 8230' - 9050'; Eocene

General Lithology

The dominant rocks in this interval are clays, with subordinate amounts of dark grey to black and buff to brown, cryptocrystalline limestone. Thin partings

of brown and grey, frequently calcareous, fissile shales are present throughout the unit and buff dolomite occurs sparsely in the upper 120'.

Micropalaeontology and Stratigraphical Conclusions

Definite Eocene rocks are encountered at 8230' and are indicated by the occurrence of Globorotalia cf. cerroazulensis, Uvigerina cf. batjesi and Globigerina galavisi. Additional evidence is supplied by the incoming of Globorotalia centralis at 8470'. Although arenaceous assemblages are characteristic of the unit as a whole, a good planktonic assemblage appears at 8670' and includes many good specimens of Acarinina pentacamerata, together with several specimens of Globigerina aff. patagonica.

(g) Eocene-Palaeocene

UNIT L, INTERVAL 9070' - 9670'; Lower Eocene - Palaeocene

General Lithology

This interval consists mostly of interbedded, brownish-grey, calcareous shales and greenish, slightly pyritic shales. At the base, however, there is a bed of dark brown, highly fissile, carbonaceous shale. Thin beds of dark grey, pyritic, or buff to light grey, sucrosic to cryptocrystalline limestones occur at a number of horizons throughout the unit while grey, cryptocrystalline, locally sphaerosideritic dolomites are also present.

Micropalaeontology and Stratigraphical Conclusions

A marked change occurs at 9070', when large, flattened radiolaria appear, numerous siderite nodules are noted and a predominantly arenaceous microfauna becomes green-stained. This change is taken to indicate the incoming of sediments of Lower Eocene - Palaeocene age.

(h) Palaeocene

UNIT M, INTERVAL 9690' - 9830'; Palaeocene

General Lithology

This interval is characterised by the presence of light grey, occasionally calcareous, banded tuffs which are associated with clays; white, tuffaceous shales; and medium to dark grey, highly micaceous, fissile shales. Thin beds of buff to light grey, glauconitic, occasionally calcareous sandstone and light grey limestone are also present. At the base of the unit, i.e. interval 9810' - 9830', are minor developments of buff, cryptocrystalline dolomite.

Micropalaeontology and Stratigraphical Conclusions

The influx of green-stained specimens of Globigerina triloculinoides which occurs at 9690' marks the upper boundary of the Palaeocene. Poor, arenaceous faunas are found within this interval.

UNIT N, INTERVAL 9850' - 10130'; ?Danian, ?Lower Palaeocene

General Lithology

This section comprises an interbedded sequence of clays; light grey to red, brown to green, occasionally pyritic shales; sandstones and dolomites. The sandstones vary from greyish-brown, calcareous and rarely glauconitic to brown, highly micaceous, very fine-grained and non-calcareous. The dolomites are buff or brown in colour and have a cryptocrystalline texture. A bed of buff, cryptocrystalline limestone occurs at the base of the interval, i.e. 10110' - 10130'.

The samples in the upper 100' of this interval contain minor amounts of tuffaceous rocks similar to those present in the overlying unit and may have caved.

Micropalaeontology and Stratigraphical Conclusions

Several specimens of Globigerina pseudobulloides and Gavelinella vombensis occur at 9850'. These forms would normally indicate Danian rocks; however,

typical arenaceous Palaeocene assemblages occur throughout this unit which may suggest that the Danian microfossils are reworked. The Palaeocene - Danian boundary is usually quite distinctive because of the large numbers of Danian forms which appear. However, this feature is not noted here, therefore a ?Danian, ?Lower Palaeocene age determination is proposed.

UNIT 0, INTERVAL 10150' - 10670'; Danian, Lower Palaeocene

General Lithology

The upper 60' of this unit resembles the overlying interval and consists of clays, some of which are lignitic, with thin beds of dark greyish-brown, carbonaceous shale; grey, glauconitic sandstone; and buff to brown dolomite and limestone.

Below 10210', the unit comprises poorly to well indurated, buff, stylolitic, locally pyritic chalk. White chert is also present, especially at 10450'. At 10290', the chalk becomes arenaceous and is associated with buff, calcareous, slightly glauconitic sandstones which vary from being compact and very hard, to fine-grained and friable. The chalk is occasionally argillaceous and, at the base of the unit, a thin bed of light grey, highly calcareous shale occurs.

Micropalaeontology and Stratigraphical Conclusions

A flood of brown-stained, benthic foraminifera appears at 10150', including Höglundina scalaris, Gyroidina subangulata, Gavelinella ekblömi and Gavelinella danica, soon to be followed by planktonic forms Globigerina pseudobulloides and Globoconusa daubjergensis. This assemblage indicates that Danian sediments have been penetrated. Many Upper Cretaceous foraminifera occur within this interval and are thought to be reworked. The first example of reworking occurs at 10230', while prominent horizons of reworking are seen at 10420' and 10490' (and samples immediately below this depth).

CRETACEOUS

UNIT P, INTERVAL 10690' - 11100'; Maestrichtian - ?Campanian, Upper Cretaceous

General Lithology

This interval consists predominantly of buff and white, stylolitic chalk with local partings of light grey, green and black, pyritic, often calcareous shale.

Micropalaeontology and Stratigraphical Conclusions

The white-stained, well preserved specimens of Bolivinoidea draco draco, Rugoglobigerina rugosa rugosa, Pseudotextularia elegans elegans and Pseudotextularia elegans fructicosa which appear at 10690' indicate the upper boundary of the Maestrichtian, Upper Cretaceous, Chalk. Other characteristic Maestrichtian forms occur later, including Bolivina incrassata gigantea, Globotruncana contusa and Stensioina pommerana. The appearance of Gavelinella aff. clementiana, (at 10750') Reussella szajnochae (at 10860') and Rugoglobigerina rugosa cf. rotundata (at 11080') may suggest that Campanian Chalk is also present within the interval, although the evidence is of a very slender nature. An age determination of Maestrichtian - ?Campanian is, therefore, proposed for this unit.

VI

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MICROPALAEONTOLOGICAL ANALYSIS CHART

CHART No. 11	11000' - 11100'
Phillips Petroleum Company, Norway	

LITHOLOGY	DEPTH IN FEET	SYSTEM	STAGE	ZONE
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1000

900

800

700

600

500

400

300

200

100

UPPER
CRETACEOUS

MAESTRICHTIAN
? CAMPANIAN

MICROFOSSILS

Rugosobiglerina rugosa rugosa
Lenticulina sp.
Gavelinopsis bembix
Pullenia cretacea
Stensioina pommerana
Gavelinella vomensis
Eponides lunata
Globigerinelloides sp.
Boliwoides draco draco
Biglobigerinella sp.
Praebulimina carseyae
Marssonella oxycona
Neosclabellina aff. reticulata
Reussella szainochae
Heterohelix cf. pertusa
Rugosobiglerina rugosa cf. rob.
Anomalinoidea velascoensis
Gyroldinoidea nitida

[illegible]

FORAMINIFERA.

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MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE	ANALYST JMB,	LOCATION
8.12.70.	MD, CWH.	Norwegian North Sea Well 2/4-5X
FOR		CHART No. 8
Phillips Petroleum Company, Norway.		8000' - 9000'

	LIMESTONE		SILTSTONE		SALT	* Rew
	DOLOMITE		SANDSTONE		COAL	
	OOOLITIC LIMESTONE		CONGLOMERATE		CHERT	
	CLAY		GYPSUM		Fossil fragments	
	SHALE		VOLCANICS		Pyrites	
	SILTY/SANDY SHALE		INTRUSIVES			

* Reworked Upper Cretaceous forms

MICROFOSSILS

Globigerina ampliapertura
Globigerina cf. eocaena
Globigerina aff. angulaturalis
Globigerina cf. gortanii
Bathysiphon cf. eocenicus
Globigerina angustilimbata
Sphaeroidina bulloides
Bigenenerina nodosaria
Globicides tenellus
Ammodiscus incertus
Sigmoilina tenuis
Nonton affine
Trochammina inflata
Sigmoilina "schlumbergeri"
Globosira charoides
Bathysiphon dubia
Glomospirella woodi
Pyrex bulloides
Hormosira sp.
Nonton roemeri
Eponides umbonatus
Sigmonorbina cf. bornemani
Trochammina sp. 2
Globicides sulcensis
Cyclammina placenta placenta
Globigerina tapuiensis
Globostomoides sp. 1
Asterigerina atrichii
Pelosina sp.
Quinqueloculina seminulum
Cyclammina cf. placenta exigua
Coscinodiscus sp.
Trochammina cf. globigeriniformis
Listerella communis
Bulimina elongata
Vertebrulina laevigata
Pullesia quinqueloba
Globicides cf. propius
Quinqueloculina impressa
Haplophragmoides sp.
Haplophragmoides carinatum
Bathysiphon eocenicus
Pullesia sphaeroides
Lenticulina cf. pseudovortex
Globorotalia cf. cerroazulensis
Uvigerina cf. batjesi
Trochammina globigeriniformis
Globigerina galavisi
Globigerina anguloroides
Gyroldina soldanii
Trochammina spectabilis
Trochammina aff. globigeriniformis
Globigerina gortanii
Trochammina sp. 1
Globigerina pera
Globostomoides sp. 2
Bulimina parisiensis
Trochammina globigeriniformis var.
Gyroldina girardana
Flutillina brevispira
Globigerina eocaena
Protatiatina bulimoides
Globorotalia centralis
Dentalina sp.
Verneuilina sp.
Coscinodiscus sp. 2
Textularia sp.
Acarinina pentacamerata
Globigerina aff. patagonica
Cyclammina cf. incisa
Dentalina sp.
Bolivinoidea sp.
Dentalina spinulosa
Nonton scaphum
Bulimina cf. ovata
Haplophragmoides aff. obliquicamerata
Involutina cf. pyroctenica

OTHER FOSSILS

Small radiolaria

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE 13.11.70.	ANALYST JMB, MD, CWH.	LOCATION Norwegian North Sea Well 2/4-5X
FOR Phillips Petroleum Company, Norway		CHART No. 4 4000' - 5000'

☐ LIMESTONE	☐ SILTSTONE	☐ SALT
☐ DOLOMITE	☐ SANDSTONE	☐ COAL
☐ OOLITIC LIMESTONE	☐ CONGLOMERATE	☐ CHERT
☐ CLAY	☐ GYPSUM	☐ Fossil fragments
☐ SHALE	☐ VOLCANICS	☐ Pyrites
☐ SILTY/SANDY SHALE	☐ INTRUSIVES	

LITHOLOGY	DEPTH IN FEET	SYSTEM	STAGE	ZONE	MICROFOSSILS
					Uvigerina hosiusi
					Cassidulina laevigata
					Sigmoilina celata
					Cibicides cf. dutemplei
					Elphidium antoninum
					Discorbis milleti
					Cassidulina oblonga
					Nonion affine
					Globigerina cf. nepenthes
					Globigerina concinna
					Cassidulina subglobosa
					Nonion boueianus
					Bolivina beyrichi
					Pullenia sphaeroides
					Globigerina praebulloides praebulloides
					Listerella communis
					Uvigerina asperula
					Rotalia beccarii var.
					Quinqueloculina seminulum
					Cibicides cf. tenellus
					Vaginulinopsis sp.
					Bulimina elongata var. tenera
					Coccolithus sp.
					Eponides umbonatus
					Nonion nonionelloides
					Loxostomum sinuosum
					Cibicides peclensis
					Cibicides cf. pseudoungerianus
					Sphaeroidina bulloides
					Bulimina cf. elegans
					Elphidium cf. inflatum
					Bulimina elongata
					Globigerina cf. venezuelana
					Pullenia quinqueloba
					Pyrgo bulloides
					Trifarina bradyi
					Globigerina angustimbricata
					Cibicides cf. sulzensis
					Cibicides lobatulus
					Epistominina elegans
					Globigerina bradyi
					Globigerina aff. ampliapertura
					Cibicides cf. aknerianus
					Karreriella siphonella
					Gyrodina girardana
					Glomospira charoides
					Haplophragmoides sp.
					Bathysiphon dubia
					Globigerina juvenilis
					Globorotalia mayeri

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE 7.10.70. ANALYST CWH, JMB, MD. LOCATION Norwegian North Sea Well 2/4-5A
FOR Phillips Petroleum Company, Norway CHART No. 3 3000' - 4000'

LIMESTONE SILTSTONE S SALT CMT Cement
DOLOMITE SANDSTONE COAL
OOLITIC LIMESTONE CONGLOMERATE C CHERT
CLAY GYPSUM F Fossil fragments
SHALE VOLCANICS P Pyrites
SILTY/SANDY SHALE X INTRUSIVES

LITHOLOGY

DEPTH IN FEET

SYSTEM

STAGE

ZONE

MICROFOSSILS

Nonion granosum
Cibicides cf. pseudonannulus
Cassidulina oblonga
Bulinina cf. elegans
Bolinina beyrichi
Discorbis militati
Rotalia beccarii var.
Cibicides pectensis
Bulinina elongata var. tenera
Elphidium antonium
Nonion affine
Elphidium asperula
Cibicides cf. dutemplei
Cibicides lobatulus var. grossa
Cassidulina laevigata
Quinqueloculina scutulum
Cibicides cf. aknerianus
Globigerina bulloides
Stenonella celata
Loxostomum sinuatum
Bulinina elongata var. subulata
Lagena sulcata
Elphidium incertum
Karreriella siphonella
Bulinina elongata
Triloculina sp.
Vaginulinopsis sp.
Glandulina laevigata
Puzosia cf. fornasinii
Elphidium sp.
Pollenia sphaeroides
Globigerina concinna
Globigerina praebulloides praebulloides
Quinqueloculina cf. buchiana
Cassidulina subulobosa
Pollenia quinqueloba
Caneris auriculus
Eponides umbonatus
Listerella communis
Planulina glauca
Globigerina angustimulicata
Nonion nonionelloides
Cibicides cf. tenellus
Nonion boucanum
Trifarina bradyi
Marginulina sp.
Globorotalia mayeri
Globigerina hosi
Globigerina cf. nepenthes
Globigerina bradyi
Sphaeroidina bulloides
Gyrodina girardana
Globigerina cf. venezuelana
Guttulina problema
Globigerina foliata
Cibicides cf. sulzensis

MIDDLE MIOCENE

ROBERTSON RESEARCH COMPANY LIMITED

MICROPALAEONTOLOGICAL ANALYSIS CHART

DATE

ANALYST

LOCATION

6.10.70.

CWH,
JMB, MD.

Norwegian North Sea Well 2/4-5X

FOR

CHART No.

Phillips Petroleum Company, Norway

1

1970' - 2000'

☐

LIMESTONE

☐

DOLOMITE

☐

OOOLITIC LIMESTONE

☐

CLAY

☐

SHALE

☐

SILTY/SANDY SHALE

☐

SILTSTONE

☐

SANDSTONE

☐

CONGLOMERATE

☐

GYPSUM

☐

VOLCANICS

☐

INTRUSIVES

☐

SALT

☐

COAL

☐

CHERT

☐

Fossil fragments

☐

☐

CMT Cement

* Reworked older Tertiary forms

LITHOLOGY	DEPTH IN FEET	SYSTEM	STAGE	ZONE
	100			
	200			
	300			
	400			
	500			
	600			
	700			
	800			
	900			
	1000			
C M T - - - - . O F		UPPER		
C M T - - - - . O F		PLIOCENE	SCALDISIAN	

MICROFOSSILS

Nonion granosum

Cassidulina laevigata

Cassidulina oblonga

Nonion affine

Discorbis milletri

Cibicides lobatulus

Elphidium cf. advenum

Quinqueloculina seminulum

Cibicides scaldisiensis

Globorotalia sp.

Uvigerina asperula

Nonion barleeanum

Cassidulina subglobosa

+ + + + + + + + + +

+ + + + + + + +

+ + + + + + + +

