CONFIDENTIAL

GEOLOGIC SUMMARY

COMPLETION REPORT

NEW FIELD WILDCAT

ESSO 16/2-1

Esso Exploration Norway Inc.

Stavanger District

Geological Office

C

Esso 16/2-1

GEOLOGIC SUMMARY

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ESSO 16/2-1

GEOLOGIC SUMMARY

I. INTRODUCTION

A. Well designation: Esso 16/2-1

B. Classification: New Field Wildcat

C. Location: Latitude 58°53'34" North
Longitude 02°21'55" East

D. Objective: To test the hydrocarbon potential of the sedimentary section; investigate the lithology and sequence in this portion of the North Sea basin; and to partially fulfill Esso's drilling obligation to the Norwegian Government incurred on behalf of the Licences.

E. Results: Non-commercial oil shows were found in tight Cretaceous carbonate rocks. These rocks were too impermeable to justify further tests.

F. Status: Esso 16/2-1 was plugged and abandoned 9 August 1967 at a total depth of 6252 feet (-6164 feet).

II. DRILLING HISTORY

A. General:

1. Spud date: 11 July 1967

2. Completion date: 9 August 1967

3. Status: Plugged and abandoned

4. Total depth: 6252 feet (-6164 feet)

B. Contractor and rig: ODECO semi-submersible "Ocean Traveler

C. Casing: 30" at 538 feet
20" at 611 feet
13 3/8" at 1192 feet
9 5/8" at 3643 feet

D. Mud program: Initial drilling from the sea floor to 1250 feet was with sea water and gel without casing. Returns were to the sea floor. Below 1250 feet to total depth of 6252 feet, a sea water slurry with gel, CMC, Spersene, XP-20, Caustic Soda, Barite, and 0-10% diesel oil was used.

E. Drilling Problems: There were no noteworthy drilling problems encountered while drilling Esso 16/2-1.

F. Cores

1. Conventional

Number	Interval (feet)	Recovery Length (feet)	Recovery Percent (%)
1.	5707-5737	30	100
2.	5737-5797	60	100
3.	5797-5854	57	100
4.	5757-5917	60	100
5.	5917-5977	60	100
6.	6165-6170	5	100
7.	6170-6180	6	60

2. Sidewall

Number	Depth (ft)	Recovery Length (inches)
1	4129	No Recovery
2	4134	2
3	4140	1 3/4
4	4426	1 3/4
5	4943	2
6	5022	1 3/4
7	5029	2
8	5038	1 3/4
9	5144	1 1/2
10	5226	1 3/4
11	5350	2
12	5360	2
13	5371	2
14	5380	1 3/4
15	5390	No Recovery
16	5545	2
17	5612	2
18	5668	2
19	5690	3/4
20	5307	3/4
21	5727	1
22	6010	3/8
23	6052	1/2
24	6058	1/4
25	6083	3/4
26	6090	3/8
27	6130	1 3/4
28	6138	1 1/4
29	6144	No recovery
30	6223	No recovery

G. Logging

1. Baroid	Interval (feet)
a. Drill time	1250-6252
b. Lithology (%)	1250-6252
c. Cuttings gas	1250-6252
d. Mud gas	1250-6252
e. Chromatograph	1250-6252

2. Schlumberger

Type Log	Depth (ft)	Run number
BHC Sonic-GR	460-1257*	1
" " "	1197-3653	2
" " "	3652-6257	3
Induction Electrical (IES)	1197-3659	1
" " "	3652-6266	2
Laterolog (LL7)	1197-3655	1
	3652-6262	2
Microlaterolog (MLL)	1197-3663	1
" "	3652-6267	2
Formation Density (FDC)	1197-3663	1
	3652-6266	2
Dipmeter (CDM)	1197-3657	1
	3652-6265	2

* Rucker Motion Arrester not used - Marine Riser not installed.

Summary: Logging operations on Esso 16/2-1 were considered routine except that Run 2 of the BHC Sonic-Gamma Ray and Run 1 of the Induction Electrical Log, Laterolog, Microlaterolog Formation Density Log, and Dipmeter were run from a bridge in the hole at 3663 feet. The final log runs overlapped this interval so there were no unlogged sections in the well.

The Rucker Motion Arrester was used on all log runs after the marine riser was installed.

H. Testing: The Schlumberger wireline formation tester (FIT) was used to test potentially hydrocarbon yielding beds with the following results:

Test No.	Depth (ft)	Hydrostat. HP (Psi)	Flowing (Psi)	Final Shut in FSIP (Psi)	Recovery	Comments
1.	5738	3800	0	100	300 cc. drilling mud.	
2.	5687	3475	225	2525	17500 cc drilling mud.	
3.	5389	3575	0	0	1600 cc drilling mud.	
4.	5703	3350	1100	2490	3350 cc mud filtrate Resistivity 0.197 at 66°F.	

I. **Abandonment:** The first stage of the bottom plug consisted of 200 sacks of cement set at 6019 feet. The second stage was 85 sacks of cement plus 2% calcium chloride set at 5400 feet. After setting, the top of the plug was tagged at 5169 feet. An intermediate plug of 200 sacks of cement plus 2% calcium chloride was set at 3750 feet. This plug was tagged at 3641 feet and a plug of 150 sacks of cement plus 2% calcium chloride was set at 3641 feet. This plug was tagged at 3076 feet.

After tagging the intermediate plug, the divers rigged a shot to part the casing. On firing the shot, the mud riser parted. The broken riser, BOP Stack, and 73 feet of 9 5/8" casing,plus hanger and seal assembly were pulled and laid down. A top plug of 80 sacks was set at 570 feet. An attempt was made to tag the plug but as there was no evidence of cement at 570 feet, another plug (100 sacks), was again set at 570 feet. The divers placed a shaped charge in the well head and the barge was moved forward 300 feet. The charge was fired and the barge was repositioned over the hole. The top plug was tagged 45 feet below the well head. An unsuccessful attempt was made to pull the guide structure free. The divers then rigged a 10 pound charge below the casing head housing, but the charge misfired due to shorting out of the Halliburton and shooting lines. The lifting slings were sheared, the guide lines were retrieved and the well was abandoned on 9 August 1967. Permission was granted by the Ministry of Industry to postpone removal of the well head of Esso 16/2-1 until the Spring of 1968 when more favorable sea conditions would prevail.

III. STRATIGRAPHY

A. Table of stratigraphy

Esso 16/2-1

Stratigraphic Units	Drill Depths (feet)	Subsea Top (Feet)	Thickness
QUATERNARY	457- 878	(- 372)	421
Pleistocene/Recent	457- 878	(- 372)	421
TERTIARY	878-5682	(- 793)	4804
Pliocene	878-2545	(- 793)	1667
Miocene	2545-3456	(-2460)	911
Upper Miocene	2545-3078	(-2460)	533
Middle Miocene	3078-3456	(-2993)	378
--------- Unconformity? ---------	3456	(-3371)	----
Oligocene	3456-4143	(-3371)	687
--------- Unconformity? ---------	4143	(-4058)	----
Eocene	4143-5682	(-4058)	539
--------- Unconformity? ---------	5682	(-5597)	----
CRETACEOUS	5682-6146	(-5597)	464
Upper Cretaceous	5682-6097	(-5597)	415
Lower Cretaceous	6097-6146	(-6012)	49
--------- Nonconformity ---------	6146	(-6061)	----
SILURIAN(?) Metamorphic Basement Rock	6146-6252	(-6061)	106

B. Lithologic description

QUATERNARY

Pleistocene/Recent (421 feet)

Returns were to the sea floor during the drilling of this interval but the Sonic-Gamma Ray log and drilling rate indicate unconsolidated, fine-grained sands, pebbles, gravels and clays similar to Esso 25/11-1.

TERTIARY

Pliocene (1667 feet)

Again, samples were to the sea floor to a depth of 1250 feet. However, the Sonic-Gamma Ray log and drilling rate suggest a lithology similar to that above. Cuttings from 1250 to 2545 feet consisted of clays, light gray, slightly silty, soft, sticky with a trace of brown-gray shale and macro-fossil fragments.

Miocene (911 feet)

Upper Miocene (533 feet)

The Upper Miocene was predominantly sand, quartzose, light gray, fine-to medium-grained, subangular to subrounded, glauconitic, unconsolidated with abundant macro-fossil fragments and clay, light gray, slightly calcareous, silty, very glauconitic. No shows were noted in the sands.

Middle Miocene (378 feet)

The Middle Miocene was predominantly shale, light brown, silty with minor sand, quartzose, unconsolidated, fine-to medium-grained, subangular to subrounded. Macro-fossil fragments were common.Soft, black lignite was abundant from 3215 feet to 3290 feet From 3330 to 3456 feet, the shales were pale red-brown, non-calcareous, carbonaceous, silty, slightly glauconitic with minor greenish gray shale. There were no shows.

Oligocene (687 feet)

The upper part of the Oligocene was primarily sand, quartzose, clear to white, fine-to medium-grained, subangular to subrounded and fragments of macro-fossils. Interbeds of shale, brown, soft, glauconitic and carbonaceous in sands were common in the middle of the Oligocene. The lower part was siltstone, dark gray- to dark tan, clayey; shale, medium gray, silty and clayey; quartz sands, fine- to medium-grained, unconsolidated and minor sands, fine-grained, consolidated. All of the Oligocene sands were water bearing but a basal sand (4122-4144 feet) had a slight trace of oil stain.

Eocene (539 feet)

The Eocene section of Esso 16/2-1 is shale with minor claystone and mudstone. Medium gray shales are prevalent in the upper portion. From 4960 to 5682 feet, dark gray, green-gray and tan-brown shales predominate. Rare chips of limestone, tan, dense, hard, were noted in the cuttings throughout the Eocene. There was a trace of oil show in claystone and mudstone from 5350 to 5370 feet.

CRETACEOUS

Upper Cretaceous (415 feet)

The Upper Cretaceous was composed of micritic limestone, light tan, slightly silicious or dolomitic, finely crystalline, hard with fair-to poor pinpoint and intercrystalline porosity. Stylolites and interlaminations of greenish gray shale were common. Permeability was very low. Below 5857; the limestone was gray-white- to very light tan and buff, micritic to slightly chalky. The top 145 feet was evenly oil-stained to a light tan color. Below 5827 feet the stain was irregular and spotty. Below 5863 feet there was no oil-stain nor show.

Lower Cretaceous (49 feet)

The Lower Cretaceous section was siltstone, dark red-brown, argillaceous, very calcareous, and slightly sandy. No shows were noted.

SILURIAN(?)

Metamorphic Basement Rock (106 + feet)

A Metamorphosed gneissic - granite rock was penetrated at 6146 feet (- 6061 feet). The gneissic-granite was light tan-to pink in color, fine to coarsely crystalline, very hard and dense with fractures which contained irregular "dead oil" or tar-stains.

ESSO 16/2-1 Preliminary Description before Slabbing

Core No. 1, 5707 - 5737' Rec. 30 feet

Limestone, micritic with rare detrital grains, light tan in color, finely crystalline - even granular, rare detrital grains, dark gray or dark green shale or claystone interlaminations. Good 2° to 5° dips on bedding. Irregular stylolites 6 to 18" apart. Fairly even light brown oil stain throughout core. Stain is dry but with good gold to dull gold Fluor. Does not stain hands. Porosity ranges from fair to good pinpoint and intergranular to tight. In porous streaks, core bubbled gas. On standing, some streaks bled light brown oil. On exposure to air and drying, limestone chalks.

Fluorescence throughout core is an even dull gold. No evidence of water.

Cut is slow in tight streaks to immediate and streaming in porous streaks - good bright white cut fluorescence for all cuts. Good high gravity sweet crude or gas odor. Fair porosity but very low permeability.

16/2-1 Preliminary Description before Slabbing

Core No. 2 5737 - 5737' Rec. 6' -

Full recovery.

Limestone, micritic with rare detrital grains tan, finely crystalline, hard. Good even light tanbrown oil stain from top of core, to base. Locally there are very tight calcareous cemented barren interbeds especially near base of core - these are zero perm interval - Core bled gas throughout entire length. Good bedding of 4° average throughout core. Abundant beautifully developed stylolites throughout core - core parts on these stylolites. No secondary cementation of stylolites noted. Near vertical partings and fractures with secondary calcite locally throughout core. Bedding planes 1-2 can apart and fractures make it nearly impossible to obtain perm. plug. Core fractures badly under hammer.

Core become more shaly at base - Megafossil fragment noted in bottom 6' feet.

16/2-1 Preliminary Description before Blasting

Core No. 3 5797 - 5857' Rec. 60' 100 %

Limestone, micritic with rare detrital grains light tan in color, finely crystalline, thin to thick bedded, stylolitic, dips flat to 4° on thin shale interbeds. Good oil stain from top of core to 5827', from this point to bottom of core, white patches of unstained lime appear as blotches. These are porcellaneous and hard, tight and impermeable. Core bled gas from top to 5843' where oil stain is spotty.

Bottom six feet of core is 99% hard and dense. With a dull-lifeless yellow fluorescence. No evidence of wet porous zones - just zero permeability.

Scattered megafossils and rare microfossils.

Esso 16/2-1 Preliminary Description before Glazing

Core No. 4 5857 - 5917 feet Rec. 60 feet 100%

Limestone, micritic to slightly chalky; grayish white to very light tan and light buff; very finely granular in spots, porcellaneous in places; fractures angularly and is hard, dense, and generally appears tight, with minor scattered very poor(?) pin-point porosity.

Unit contains abundant stylolites, generally spaced from 1/4- inch to six inches apart, and often containing a dark gray, black, or occasionally reddish gray material along the suture planes. This matter appears to be soft, greasy, and slickensided non-calcareous Shale containing partings and irregular concentrations or pyrite.

Random slight relict traces of fossil fragments occur in the limestone; alteration is such in places to suggest that the limestone itself has been altered to its present form. The bottom three feet of the core is a hard chalky limestone. Overall core dips vary from zero to a few degrees.

Abundant, but not universal, fluorescence occurs in the upper six feet of the core, where spotty oil stains produce a scattered good natural fluorescence and a fair cut giving a bright light yellow fluorescence in chloroethane; below the upper part of the core the natural fluorescnece is very random and spotty and produces no cut, and the stains do not occur.

Note: Baroid core analyses give the following results for Core No. 4: At 5862 feet, W. Sat. 75%; Por. 19%; Trace Oil; Perm. almost nil. At 5916 feet, W. Sat. 79%; Por. 23.3%; Oil - 0%; Perm. almost nil.

CORE ANALYSIS REPORT

COMPANY ESSO EXPL NORWAY INC
WELL 16/2-1
FIELD W.C.

COUNTY NORTH SEA
STATE NORWAY
CONV DIAMETER 4"

DEPTH	LITHOLOGY		%		WATER	% GAS VOL	REMARKS
5707	LS	3.6	28.8	17.3	27.7	15.8	36.4° API OIL
5719	LS	0.35	28.4	12.9	30.6	16.1	34.6° API OIL
5721	LS	0.31	27.0	20.9	53.0	07.1	33.8° API OIL
5721.5	LS	0.66	27.0	15.2	51.5	09.1	30.0° API OIL
5726.5	LS	0.44	25.8	19.0	55.2	06.6	29.4° API OIL
5[illegible]2	LS	0.42	24.8	27.6	31.4	27.6	28.0 API OIL
	CORE NO. 1 5707'-5737'						

CORE ANALYSIS

COMPANY ESSO EXPL NORWAY INC — NORTH SEA
WELL 16/2-1 — NORWAY
FIELD W.C. — CONV — DIAMETER 4".

DEPTH	LITHOLOGY							REMARKS
5740	LS	1.3	15.0	37	51	1.9	31.8° API	OIL
5744	LS	—	20.4	16	41	8.8	35.0° API	OIL
5751	LS	0	12.6	22	58	2.5	35.5° API	OIL
5759	LS	—	23.6	14	35	12.2	35.5° API	OIL
5773	LS	—	24.0	18	38	10.6	33.8° API	OIL
5780	LS	0	23.5	23	28	11.5	33.8° API	OIL
5789	LS	—	21.2	15	33	10.5	34.5° API	OIL
5796	LS	0.46	17.4	9	31	11.0	35.5° API	OIL

CORE NO. 2 5737'-5796'

CORE ANALYSIS REPORT

COMPANY ESSO EXPL NORWAY INC
WELL 16/2-1
FIELD W.C.

COUNTY NORTH SEA
STATE NORWAY
CONV DIAMETER

DEPTH	LITHOLOGY	PERM MD	POROSITY %	OIL	WATER	GAS	REMARKS
5799	LS	0.04	23	10	38	12	33.8° API OIL
5807	LS	0.23	19	27	34	7	31.8° API OIL
5850	LS	0.08	28	13	49	11	33.8° API OIL
	CORE NO. 3 5796'-5856'						

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CORE ANALYSIS REPORT

COMPANY ESSO EXPL NORWAY INC. COUNTY NORTH SEA
WELL 16/2-1 STATE NORWAY
FIELD W.C. TYPE OF CORE CONV DIAMETER 4"

DEPTH	LITHOLOGY	PERM. md.	POROS. %	SATURATIONS % PORE SPACE OIL	WATER	% GAS BULK VOL.	REMARKS
5862	LS	0.12	19	TR	75	4.6	
5916	LS	0.11	23.3	0	79	4.9	
	CORE NO. 4 5857'-5917'						

CORE ANALYSIS REPORT

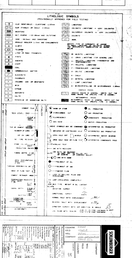
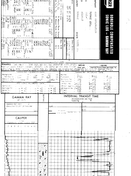
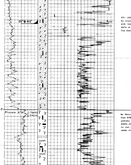
COMPANY ESSO EXPL NORWAY INC COUNTY NORTH SEA
WELL 16/2-1 STATE NORWAY
FIELD W.C. TYPE OF CORE CONV DIAMETER

DEPTH	LITHOLOGY	GRAIN DENS	POROS %	SATURATIONS % PORE SPACE OIL	WATER	% GAS BULK VOL	REMARKS
5941	LS	—	15.2	0	71	4.4	
5977	LS	—	14.6	0	93	1.0	
	CORE NO. 5 5917'-5977'						

PROPRIETARY EXPLORESSO

Well: Nova Exploration Norway AS - 6472/1-1		Drilling Period: August 8 - October 1			
Rig: Maersk Giant (Floating Drilling)	Lat: 62°8'6.0"	Long: 1°8'0.0"	Water Depth: 1	Drilling Depth: 1	Rotary Table: 1
Operator: Nova Exploration Norway AS	Rig Contractor: Maersk Drilling	Elevation of Rotary Table: 22.0 m			
Operator's Representative: Erik Johnsen	Drilling Supervisor: Kjetil Hansen	Drilling Fluid: Type: Water Based Density: 1.03 - 1.05 g/cm³		Drilling Contractor: Schlumberger	
Operator's Representative: Bertolv Olsen	Drilling Supervisor: Kjetil Hansen	Drilling Fluid: Type: Water Based Density: 1.03 - 1.05 g/cm³		Logging Contractor: Schlumberger	
Geologist: Ole Jørgen Hansen	Geologist: Kjetil Hansen	Drilling Fluid: Type: Water Based Density: 1.03 - 1.05 g/cm³		Logging Contractor: Schlumberger	
Geologist: Bertolv Olsen	Geologist: Kjetil Hansen	Drilling Fluid: Type: Water Based Density: 1.03 - 1.05 g/cm³		Logging Contractor: Schlumberger	
Geologist: Ole Jørgen Hansen	Geologist: Kjetil Hansen	Drilling Fluid: Type: Water Based Density: 1.03 - 1.05 g/cm³		Logging Contractor: Schlumberger	

Logging carried to Sonic Log

LOGS RUN

1.0	1.1	1.2	1.3	1.4
1.07 - 1.0000	1.07 - 1.0000	1.07 - 1.0000	1.07 - 1.0000	1.07 - 1.0000
0000 - 0.0000	0000 - 0.0000	0000 - 0.0000	0000 - 0.0000	0000 - 0.0000
Log Type	Log Type	Log Type	Log Type	Log Type
	0000 - 0.0000			
	1.07 - 0.0000			
	0000 - 0.0000