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NORSK HYDRO a.s  
FINAL REPORT  
WELL 16/3-2  
LICENCE 007 NORWAY

**FORTROLIG**  
i h.t. Beskyttelsesinstruksen,  
jfr. offentlighetslovens  
§ ..... nr. ....

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P R E F A C E

Licence 007 was awarded the Petronord group in 1965.  
The group now consists of the following companies:

Elf Norge A/S	21.584	per cent
Total Marine Norsk A/S	16.188	" "
Aquitaine Norge A/S	10.792	" "
Norsk Hydro Produksjon a.s	26.800	" "
Eurafrep Norge A/S	1.824	" "
Coparex Norge A/S	1.596	" "
Cofranord A/S	1.216	" "
Phillips Petroleum Co. Norway	14.78	" "
Norsk Agip A/S	5.22	" "

The well 16/3-2 was drilled by Norsk Hydro Produksjon a.s  
on behalf of the operator, Elf Norge A/S.

S U M M A R Y

Well 16/3-2 was a replacement for well 16/3-1 which was lost due to tilting of the BOP stack.

The objectives were to investigate possible sand development in Paleocene, an expected reservoir improvement in the Danian chalk, and a possible pinch-out trap in the Jurassic sand.

The well was spudded in on February 11, 1976, and final abandonment took place 26 days later after having reached a total depth of 2019 m.

A location map is found in fig. 1, page iii.

A summary of well data is presented in table 1, page iv.

Location of well 16/3-2

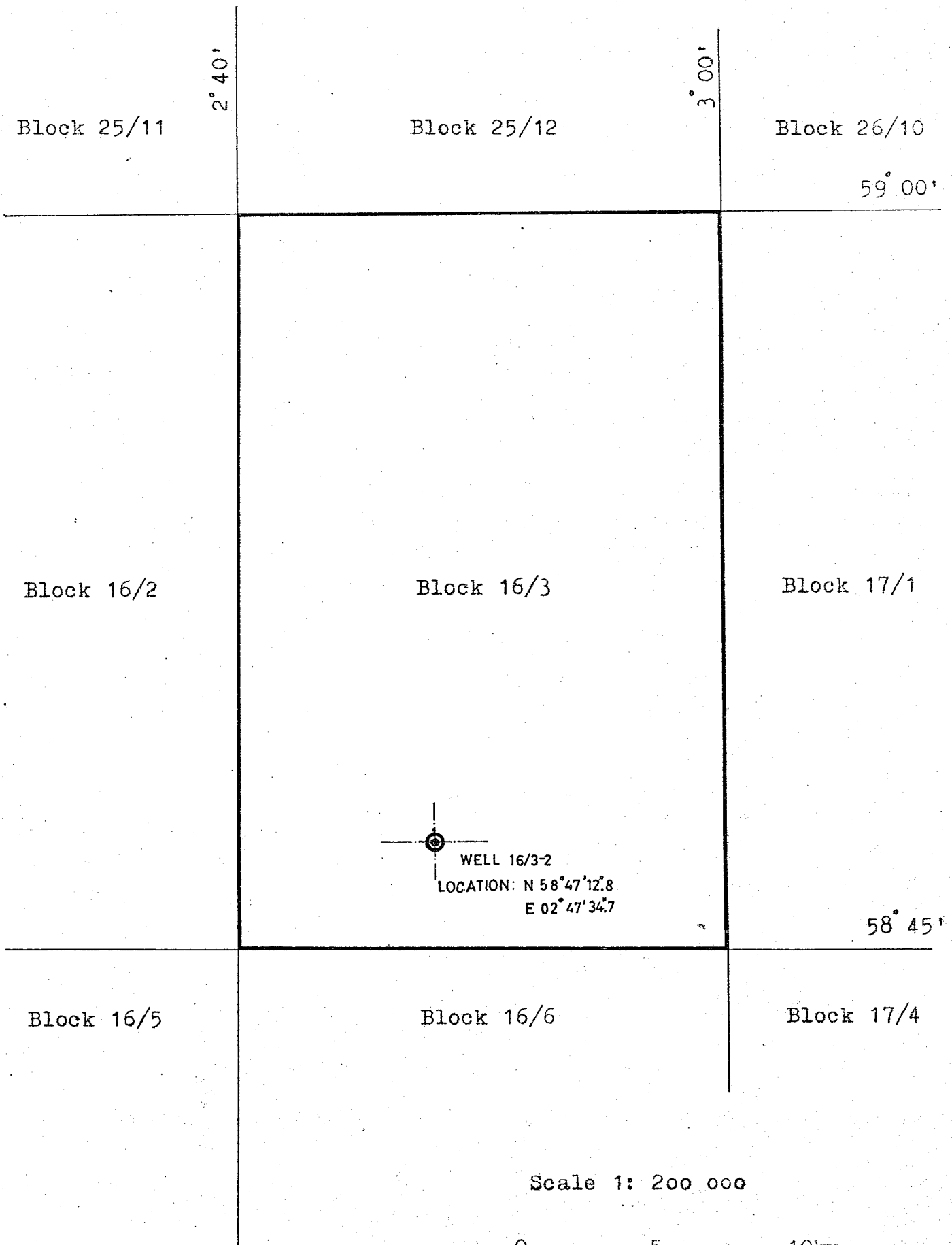


TABLE 1

Summary of well data

Location		58°47' 12.8" 02°47' 34,7"
Operator		Elf Norge A/S
Drilling supervision		Norsk Hydro Produksjon a.
Rig		Polyglomar Driller
Contractor		Rasmussen Global Marine Ltd.
RKB elevation (to MSL)		24.0 m
Water depth		118 m.
Spudded		February 11, 1976
Abandoned		March 8, 1976
Well program:	Hole diameter:	36" to 191 m 26" to 212 m 17½" to 445 m 12-1/4" to 1319 m 8½" to 2019 m
	Casing record:	30" set at 190.5 m 20" set at 207 m 13-3/8" set at 440 m 9-5/8" set at 1314 m

S E C T I O N   A

O P E R A T I O N S

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1. Location survey

A/S GEOTEAM performed a site survey with echo-sounder and side scan sonar during the period from the 19th to the 22nd of December 1975.

The area surveyed was a 2 x 2 kilometers square with its base aligned E - W and centered at:

58°47'11" N

02°47'36" E

The sea floor was found to be gently undulating, nearly flat, throughout the whole area. The water depths varied between 118.0 meters and 119.5 meters.

The sea bed was interpreted to consist mainly of loose or soft sediments with localized areas of coarser or denser material.

No obstructions or other special features were recorded in the area.

2. Positioning and anchoring of rig

Position for the first spud in with reference to European datum was:

Latitude:  $58^{\circ}47'12''.880$  N

Longitude:  $02^{\circ}47'32''.250$  E

At a depth of 445 m the BOP-stack was found to be tilted 6 deg. from vertical. The decision was made to abandon and the rig was moved over approximately 40 m due East to the final location.

Latitude:  $58^{\circ}47'12''.8$

Longitude:  $02^{\circ}47'34''.7$

The anchor test is presented in table A.1 and the anchor pattern is shown in fig. A.1.

Table: A.1

ANCHOR TENSIONING, WELL 16/3-2

ANCHOR NO	ANCHOR TENSION TEST
1	300 000
2	275 000
3	300 000
4	300 000
5	275 000
6	275 000
7	325 000
8	200 000

### 3. Resume of operations

#### 3.1 Summary

The rig was moved over to its new location, and the well was spudded in on February 11.

The 36" hole was drilled to 191 m. The 30" casing shoe was landed at 190.5 m and cemented with return to the ocean floor.

The 26" hole was drilled to 212 m and 4 joints of 20" casing were set with the shoe at 207 m.

The BOP and riser were run and tested.

The 17½" hole was drilled to 445 m.

The 13-3/8" casing was landed with the shoe at 440m. The BOP and seal assembly were tested before the cement was drilled out.

The 12-1/4" hole was drilled to 1319 m. Some tight spots were encountered in this interval.

The 9-5/8" casing was run and landed with the shoe at 1314 m.

The BOP and seal assembly were tested before the cement was drilled out. A leak-off test was carried out after having drilled to 1324 m.

One cone on the bit was lost at 1514 m and a junk basket was run without recovery of the cone. A junk sub was used above the bit and the drilling continued to 1985 m. Coring took place from 1985 m to 2005 m in two steps, but only 1.8 m of core were recovered. The 8½" hole was extended to 2017 m before core no. 3 was cut from 2017 m to 2019 m. The core recovered revealed 1.04 m of the basement.

Logs and side wall core guns were run before the hole was plugged.

The casings were cut and the wellhead was retrieved before the location was left on March 8th, 1976.

A record of hole deviations at different depths is shown in table A.2.

Table: A.2

HOLE DEVIATION

<u>Depth (m)</u>	<u>Totco deviation (deg)</u>
191	1-1/4°
212	1/8°
445	1/2°
1319	1/4°
1659	1/2°
1951	3/4°

### 3.2 Activity report

Total time on this location was 26.7 days, but only 19 days were used before total depth was reached. The time distribution is presented in table A.3 and fig. A.3.

A total of 5.4 days were spent on drilling only which accounts for 20.2 % rotating time while tripping and deviation surveys account for 14% of total time.

The casings were run and cemented without any particular problems. 3.9 days or 14.6% of the time were used for these operations.

Logging, sidewall coring and the cutting of three cores took a total of 3.0 days (11.5%). These operations are listed as formation evaluation.

Only 1.1 days or 4.2% of the total time were used running, retrieving and testing the wellhead, BOP, and riser.

The fishing operation (0.5 days) was one trip in the hole attempting to retrieve one bit cone.

2.2 % of the time or 0.6 days were lost waiting on the weather before the anchors could be pulled.

9.4% of the time was lost due to miscellaneous problems.

The major item is repair work after having pulled out the diverter and the rotary table while pulling 10" drill collars.

Plug and abandonment account for as much as 4.1 days or 15.3% of the total time.

Table A.3

TIME DISTRIBUTION

Operation	Days	Percentage of total time on location
1 Under way	0,187	0,70
2 Mooring	0,187	0,70
3 Drilling	5,406	20,23
4 Tripping - Survey	3,739	14,02
5 Circulating	0,354	1,33
6 Run - cement casing	3,885	14,55
7 Formation evaluation	3,072	11,52
8 Subsea equipment	1,125	4,21
9 Lost time - DRGL equip.	1,031	3,87
10 " " - Subsea equip.		
11 " " - Fishing	0,447	1,68
12 " " - Hole problems	0,250	0,94
13 " " - Mooring system		
14 " " - W O weather	0,583	2,19
15 " " - W O equip.		
16 " " - W O orders	0,020	0,08
17 " " - Completion equip.		
18 " " - Other	2,500	9,37
19 Plug and Abandon	4,083	15,31
20 Sub total	26,666 days	100%

### 3.3 Diary report

February 10, 1976

Well 16/3-1 was abandoned at 1100 hrs, February 10, The rig was moved 40 m due east from 16/3-1 location. Rigged up and made up 36" holeopener.  
Depth: 142 m.

February 11, 1976

Spudded the well 16/3-2 at 03.00 hrs. Drilled 36" hole to 191 m with sea water and slugs of mud. Rigged up to run 30" casing. Went in hole with 30" casing; jumped divers to make observation. Guide base was found 3 m off bottom. Cemented 30" with 100% gel cement and 200% neat cement.

Went down with 26" bottom hole assembly. Drilled 191 - 212 m with sea water plus gel slugs.  
Depth: 212 m.

February 12, 1976

Ran 2 Totco surveys, 0,5<sup>0</sup> at 212 m. Rigged up and ran 20" casing; cemented the same with returns to the sea-floor. Ran BOP stack and riser.  
Depth: 212 m.

February 13, 1976

Ran 20" wear bushing and tested kill and choke lines with 5000 psi and diverter with 100 psi. Went down with 17½" bottom hole assembly. Drilled cement from 205 m to shoe at 212 m. Drilled to 294 m.  
Depth: 294 m.

February 14, 1976

Drilled 17½" hole from 294 m to 445 m. Circulated and dropped Totco survey. Circulated and spotted 1.2 sp.gr. mud. POOH. Ran 10" DC into diverter and pulled out



the rotary. Worked on rotary. RIH to retrieve wear bushing.

Depth: 445 m.

February 15, 1976

Rigged up to run casing. Ran 13-3/8" casing and landed at 440 m. Circulated with sea water and cemented. Backed out 13-3/8" running tool, washed the housing. Made up and ran seal assembly, tested the same to 1000 psi. Tested the BOP.

Depth: 445 m.

February 16, 1976

Ran the 13-3/8" wear bushing. Installed a new flow line. Made up, and ran in hole with 12-1/4" bottom hole assembly. Tagged float at 425 m. Drilled out the cement and down to 603 m.

Depth: 603 m.

February 17, 1976

Drilled 12-1/4" hole from 603 to 905 m, reamed every joint after 650 m. POOH to change bit. RIH to 790 m and reamed down to 830 m. Drilled from 905 to 914 m.

Depth: 914 m.

February 18, 1976

Drilled from 914 - 1160 m. Tight spot at 1160 m. Circulated and conditioned hole and drilled down to 1319 m. Circulated and conditioned hole before trip.

Depth: 1319 m.

February 19, 1976

POOH with drag to 890 m. Reamed and washed from 875 to 905 m. Continued POOH to 840 m, drag again. Washed from 825m to 865 m. POOH. Removed jets from bit, changed BHA and RIH. Circulated and conditioned hole for logs. Spotted heavy gel mud in hole. Ran logs until

winch chain broke on logging unit. Repaired the same and ran logs from 1319 m to 440 m.

Depth: 1319 m.

February 20, 1976

RIH to 1319 m. No fill. Circulated and conditioned hole to run casing.

Had some trouble retrieving the wear bushing. Washed the wellhead and succeeded in second attempt. Rigged up and ran 9-5/8" casing. Landed casing with shoe at 1314 m.

Depth: 1319 m.

February 21, 1976

Cemented 9-5/8" casing. Washed wellhead and flushed kill and choke lines with sea water. Set seal assembly, tested the same and upper Hydril to 1500 psi.

Tested Hydril against seal assembly to 2500 psi.

Tested rams against seal assembly to 5000 psi.

Tested casing against shear rams to 2500 psi.

Ran temperature log and made up 8 1/2" bottom hole assembly. Depth 1319 m.

February 22, 1976

Ran in hole with 8 1/2" bit and hit the float at 1302 m. Drilled float, shoe and down to 1324 m. Hung off on top pipe ram and ran leak off test. Drilled from 1324 to 1491 m. Checked for flow and circulated out samples at 1360 m, 1400m, 1429 m and 1491 m. Negative flow at each of the given levels.

Depth: 1491 m.

February 23, 1976

Drilled from 1491 to 1514 m. POOH to change bit.

RIH and drilled from 1514 m to 1659 m. Circulated and conditioned mud to run logs.

Depth: 1514 m.

February 24, 1976

POOH, one cone on bit was lost. Ran logs. RIH with junk basket. Fished for cone and bearings. POOH. Nothing was recovered in the basket. RIH with new 8½" bit and junk-sub.  
Depth: 1514 m.

February 25, 1976

Reamed from 1623 m to 1659. Washed and worked junk from bottom. Drilled from 1659 m to 1792 m.  
Depth: 1792 m.

February 26, 1976

Drilled from 1792 m to 1943 m.  
Depth: 1943 m.

February 27, 1976

Drilled from 1943 m to 1951 m. POOH. No drag. Cleaned junk sub. No recovery of junk. Changed bit. RIH. Drilled from 1951 m to 1985 m. Circulated and conditioned mud. POOH and picked up core barrel. RIH with same.  
Depth: 1985 m.

February 28, 1976

Cut core from 1985 m to 1998 m. Broke off core and circulated bottom up. POOH. No recovery. Ran in hole with core barrel and new bit. Cut core from 1998 to 2005 m. POOH. Got 1.8 m recovery. RIH and drilled from 2005 m to 2017 m. Circulated bottom up.  
Depth: 2017 m.

February 29, 1976

POOH to cut core number 3. Ran in hole with core barrel and drilled from 2017 m to 2019 m. Broke off core, and POOH. Recovered 1.04 m of basement in the core barrel. Rigged up and ran logs.  
Depth: 2019 m.

March 1, 1976

Ran two sidewall core guns. Spotted cement plug from 2019 to 1900 m.  
Depth: 1900 m.

March 2, 1976

Tried to circulate before setting plug number 2 without succeeding. POOH and laid down 16 joints of drill pipe filled with cement. RIH and set plug number 2 at 1363 m. POOH. Set bridge plug at 1168 m. POOH. RIH open ended and tagged packer. Set cement plug from 1168 m to 1118 m. Set cement plug number 5 from 500 m to 400 m. Pulled 7 stands and displaced hole with sea water.  
Depth: 400 m.

March 3, 1976

Unlatched and picked up the diverter. Picked up slip-joint and pulled riser and BOP stack. Made up 9-5/8" cutting test assembly. Ran in hole to 239 m and cut the 9-5/8" casing. POOH. RIH to spear the same. POOH with 9-5/8" casing.  
Depth: 400 m.

March 4, 1976

Ran in hole open ended and set cement plug number 6 from 260 to 190 m. POOH. Made up and ran 13-3/8" cutting assembly in hole. Cut casing. RIH and speared 13-3/8" casing.  
Depth: 190 m.

March 5, 1976

Tried to cut both 20" plus 30" casing, succeeded only in cutting the 20". Cut the 30" casing after changing knives. Could not pull the 20" casing. Cut 20" casing again and picked up 18-3/4" wellhead running tool. RIH.  
Depth: 190 m.

March 6, 1976

Positioned rig in attempt to make up 20" running tool, -  
no success. Rigged up and ran into hole with charge  
and blew the wellhead off at 146 m.  
Retrieved 20" and 30" wellheads, with four post guide  
frame.

March 7, 1976

Started to deballast rig and pull anchors. Had to cut  
part of no. 7 anchor chain before pulling no. 7 anchor  
due to deformed lines.

March 8, 1976

The last anchor was pulled and the location was left at  
0300 hrs March 8, 1976.

4. Abandonment of the well

The abandonment program is shown in fig. A.4.

A cement plug was spotted from TD (2019m) up to 1900 m. Cement plug no. 2 was spotted from 1363 m to 1264 m (at the 9-5/8" casing shoe) using 120 sacks class G neat cement. A Baker bridge plug was set at 1168 m. Cement plug no. 3 was spotted from 1168 m to 1118 m inside the 9-5/8" casing with 60 sacks class G cement. Cement plug no. 4 was placed from 500 m to 400 m with 120 sacks class G cement.

Cut 9-5/8" casing at 239 m.

Cement plug no. 5 was placed from 260 m to 190 m with 145 sacks class G cement.

Cut 13-3/8" casing at 160 m.

The 20" and 30" casings were apparently cut as the cutting knives were in the fully extended position. The wellhead was pulled with 350,000 lbs without any movement and a shaped charge was decided used. The 20" and 30" casings were blown off at 147 m, 5 m below the sea bed. A final inspection of the sea bed was made by the divers. No obstructions were found remaining after the drilling operation.

The inspection certificate is found in fig. A.5.

5.1 Materials report

Casing and wellhead

A CIW wellhead system was employed. The 36" hole was drilled without any guidance system. The 30" casing was run with the 4- post guide base. The 26" hole was drilled without riser. A 18-3/4" wellhead housing was installed with the 20" casing and the 10,000 psi WP BOP stack was latched to this housing. The following casings were run:

Size	Grade	Weight lbs/ft	Setting depth m
30"	1"	310	190
20"	X-52	94	208
13-3/8"	K-55	68	440
9-5/8"	N-80	47	1314

5.2 Drill bit record

The drill bits used in this well are specified in the bit record, table A. 4.

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# BIT RECORD Table A.4

COUNTY		FIELD <b>NORTH SEA</b>		STATE <b>NORWAY</b>		SECTION	TOWNSHIP	RANGE	LOCATION <b>16/3</b>	WELL NO. <b>2</b>	
CONTRACTOR <b>RASHUSSEN GLOBAL MARINE LTD</b>			RIG NO. <b>POLY GLONAR DRILLER</b>	OPERATOR			TOOLPUSHER	SALESMAN			
SPUD <b>11.2.76</b>	UNDER SURF.	UNDER INTER.	SET SAND ST.	REACHED T.D.	PUMP NO. 1	LINER <b>6 1/4"</b>	PUMP NO. 2	LINER <b>6 1/4"</b>	PUMP POWER <b>1500</b>	TYPE MUD <b>SALT WATER GEL</b>	
DRILL PIPE <b>5" GRADE E</b>		TOOL JOINTS	SIZE <b>6 1/2"</b>	TYPE <b>NC 50</b>	O.D.	DRILL COLLARS	NUMBER	O.D.	I.D.	LENGTH	DRAWWORKS POWER <b>2250</b>

NO.	SIZE	MAKE	TYPE	JET 32ND IN	SERIAL	DEPTH OUT	METRE	HOURS M/HR	ACCUM DRLG. HRS.	WT. 1000 LBS.	R P M	VERT DEV.	PUMP PRESS	PUMP OPER- ATION	S P M		MUD			DULL. COND.				FORMATION REMARKS	
															1	2	WT.	VIS.	W.L.	T	B	G	OTHER		
1	36"	SERVCO	HO			191	49	3	16.3	7/8	100	1/4	400	P	98	9.5									
2	26"	SMITH	DS	REG	147AF	212	21	3.5	6	10	75		500	P	95	9.5									
3	17 1/2"	HTC	OSC-309	3x18	59071	445	233	11	21.1	30	100	1/2	1875	P	100	100									
4	12 1/4"	SMITH	ES-2	3x11	51267	905	460	18.5	24.8	15	150		3000	P	55	5.5	9.3	3.5							
5	12 1/4"	SMITH	ES-2	3x11	51265	1319	414	22.5	18.4	25	150		3000	P	53	5.3	9.5	4.5							
6	8 1/2"	SMITH	SS KJ	3x10	14298	1514	195	14	13.9	30	125		450	S	35		9.6	5.0							
7	8 1/2"	SMITH	SS KJ	3x10	20325	1659	145	11.25	12.8	35	100		1650	S		6.7	10.0	5.0							
8	8 1/2"	HTC	J-33	3x11	83929	1951	292	47.5	6.1	35	65	1/2	3000	S	97		10.2	4.5							
9	8 1/2"	SMITH	ESSKT	3x11	20390	1985	34	2	1.7	35	110		3000	S	95		10.2	4.5							
10	8 1/32"	CHRISTENSEN	PC-22		1120996	1998	13	0.75	1.3	10	60		550	S	40		10.4	4.2							
11	8 1/32"	CHRISTENSEN	PC-18		1120976	2005	7	0.5	1.4	8	80		700	S	40		10.7	5.7							
12	8 1/2"	SMITH	EMZK	3x11	20440	2017	12	1.25	6.8	28	80		3000	S	95		10.4	4.6							
13	8 1/32"	CHRISTENSEN	C-22		P7106	2019	2	3	0.6	12	100		725	S	52		10.4	4.5							

Table A.4



5.3 Mud report

PHASES:

- 36" hole 30" csg. Drilled with sea water, return to sea bed. Filled the hole with spud mud (gel & lime) for setting of 30" csg. Drilled out cement with sea water.
- 26" hole 20" csg. Drilled with sea water. Spotted 50 bbl 1.20 sp.gr. mud before running 20" csg. Drilled out cement with sea water.
- 17½" hole 13-3/8" csg. Drilled with sea water to 445 m and circulated hole. Displaced hole with 600 bbls. prehydrated bentonite and circulated. Spotted 240 bbls mud. Circulated with sea water before cementing 13-3/8" casing.
- 12-1/4" hole 9-5/8" csg. Drilled cement with sea water. Displaced sea water with 420 bbls mud. Drilled to 905 m. MW = 1.10/Visc. = 35. Pumped high visc. mud to clean hole. Reamed hole. Increased weight to 1.27 at 1000 m. Drilled to 1319 m. Circulated and conditioned mud due to sloughing shale problems from 800 - 900 m. Spotted high visc. mud before running logs. MW = 1.18 Visc. = 120 Circulated before running csg. Lost 50 bbls to formation when attempting to circulate before cementing 9-5/8" casing.
- 8½" hole Installed 40/40 - 80/80 mesh screens on shakers. Drilled out float collar and cement with sea water. Drilled to 1450 m when hole became tight. MW = 1.15 Visc. = 50. Circulated 50 bbls high visc. mud to clean the hole.

Drilled to 1659 m and increased the viscosity prior to logging.

MW = 1.22 Visc. = 45

Increased mud weight to 1.25 at 1985 m. before coring. Pumped slug before POOH when coring.

A summary of mud properties is shown in table A.5.

Table A.5  
MUD SUMMARY - WELL 16-3-2

MUD SYSTEM - SEAWATER GEL

Depth m	W.T. Sp.gr.	Funn Visc.	P.V. cp	Y.P. lb/100ft <sup>2</sup>	Gels lb/100 ft <sup>2</sup>	Ph	Water loss	Cake 32nd in	Pm	pf/mf	Chloride ppm	Calcium ppm	Sand %	Solids %	Oil %	Water %	Metk blue
191	1.2	150															
212	1.07	130															
212	1.05	125	12	54													
294	1.05	125	12	54													
445	1.06	130	15	70	35/45	10.5	25	3	4.0	.2/4	5000	80		3.5		96	25
440	1.06	130	15	70	35/45	10.5	25	3	4.0	.2/4	5000	80		3.5		96	25
603	1.08	35	6	8	1/3	9.0	10	1	.7	.1/-	7000	250		4		96	17
905	1.10	35	12	7	2/6	8.5	4	1	-	.1/-	8000	240		6		94	20
968	1.10	47	17	14	3/13	9.0	2.7	1	1.7	.9/-	5000	40	TR	7	0	83	25
1319	1.15	46	19	13	2/5	9.0	2.8	2	-	.4/-	18000	80	TR	7	0	93	29
1319	1.15	120	20	56	10/29	9.0	3.0	2	-	.3/-	18000	120	0	7	0	93	32
1319	1.15	50	19	16	2/13	9.0	3.0	2	1.1	.3/-	18000	240	TR	8	0	92	30
1319	1.15	44	18	11	2/10	9.0	3.0	2	1.2	.4/-	18000	40	0	8	0	92	21
1510	1.16	50	15	13	2/8	9.0	3.2	2	1.0	.2/-	18000	60	0	9	0	91	27

Table A.5  
Sheet 1 of 2

MUD SUMMARY-WELL 16/3-2

Depth m	W.T. Sp.Gr	Funn Visc.	P.V. cp	Y.P. lb/100ft <sup>2</sup>	Gels lb/100ft <sup>2</sup>	Ph	Water loss	Cake 32nd in	Pm	Pf/Mf	Cloride ppm	Calcium ppm	Sand %	Solids %	Oil %	Water %	Met blue
1659	1.21	64	21	26	2/18	9.0	3.0	2	1.3	2/9	18 000	80	0	10	0	90	30
1659	1.22	55	16	14	4/6	9.0	4.0	2	1.0	-	18 000	90	-	10	-	80	25
1943	1.22	45	15	13	3/20	10.0	4.4	1	1.3	5/.9	18 000	40	-	9	-	91	25
1985	1.22	45	17	17	3/25	9.0	4.0	1	.9	4/1.1	18 000	40	-	9	-	91	25
2017	1.28	57	25	18	7/40	8	4	1	-	-	18 000	80	.5	11	-	88.5	25
2019	1.25	55	19	23	10/45	8	4	1	-	-	18 000	110	-	10	-	90	25

Table A.5  
Sheet 2 of 2

5.4. Cement report

The 30" casing was cemented with 200 sacks class G neat cement with 2%  $\text{CaCl}_2$  and 8% bentonite.

The 20" casing was cemented with 250 sacks class G cement with 8% bentonite and 2%  $\text{CaCl}_2$  followed with 100 sacks class G neat cement with 3%  $\text{CaCl}_2$ .

The 13-3/8" casing was cemented with 300 sacks class G cement with 12% bentonite followed by 200 sacks class G cement with 2%  $\text{CaCl}_2$ .

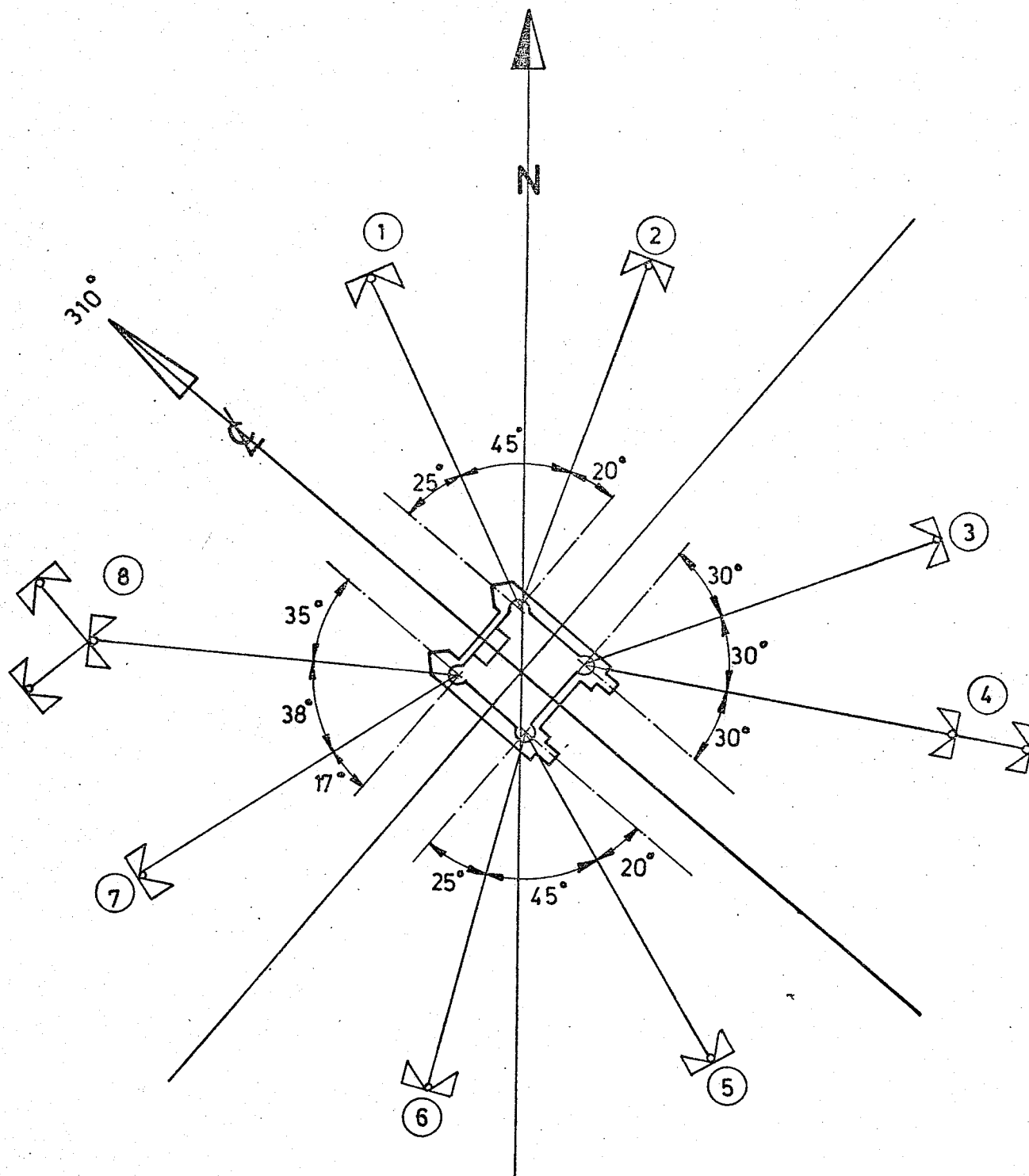
The 9-5/8" casing was cemented with 975 sacks class G cement. Temperature log revealed top of cement at 500 m.

# MOORING LINE PATTERN

POLYGLOMAR DRILLER

WELL 16/3-2

(FWD PILOT HOUSE END)



HEADING: 310°

Well coordinates: N 58° 47' 12".8  
E 02° 47' 34".7

Water depth (MSL ): 118 m

Fig. A1

FIGURE A.2

DRILLING PROGRESS, WELL 16/3-2

Operator: Norsk Hydro a.s  
 Coordinates: 58° 47' 128"N  
 02° 47' 34,7"E

Spud in: February 11<sup>th</sup> - 76  
 Well compl: March 8<sup>th</sup> -76  
 Rig: Polyglomar Driller

Water depth: 118m  
 RKB to MSL: 24m  
 RKB to SeaBed: 142m

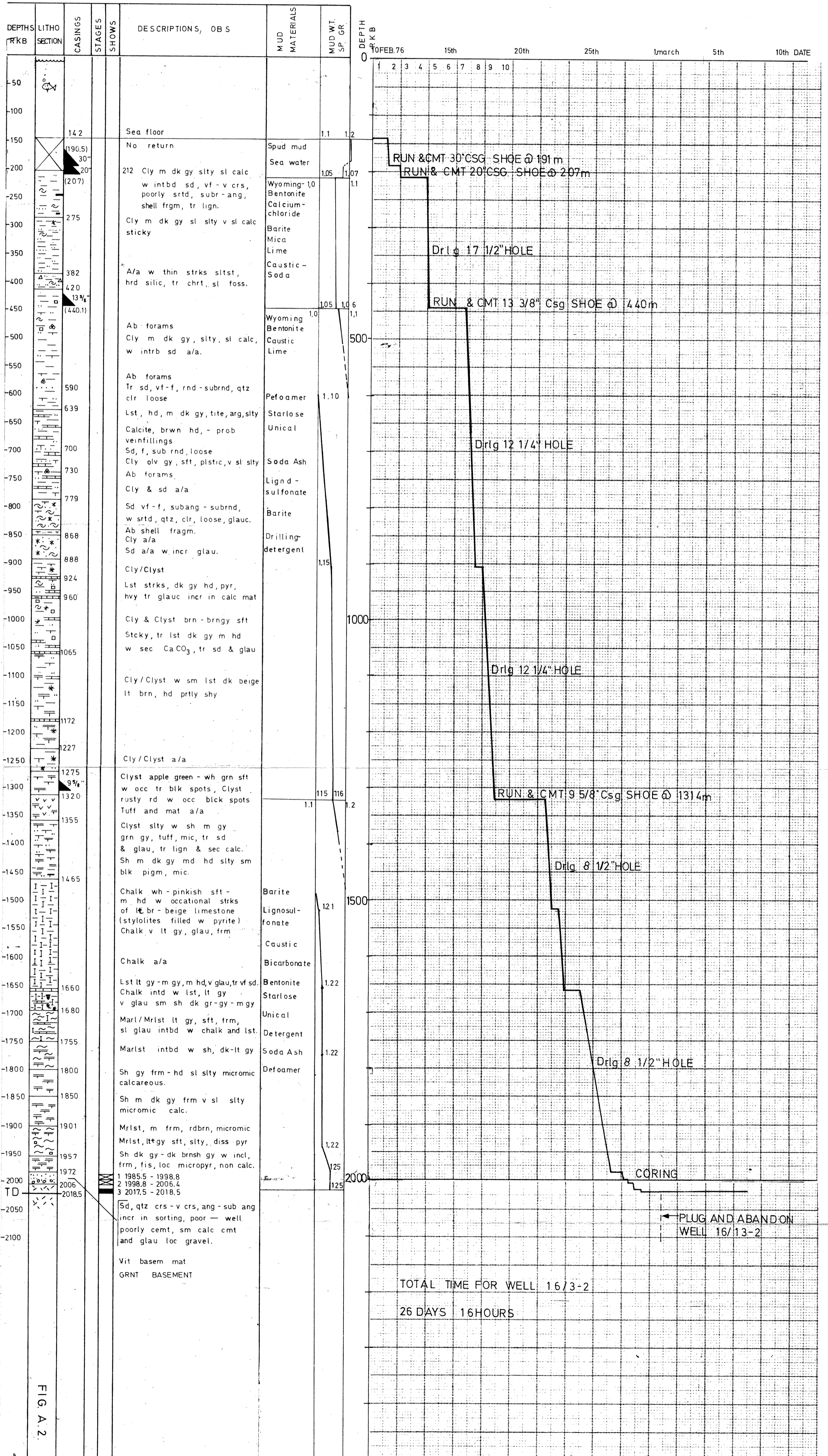


FIG. A.2

FIGURE A3

TOTAL TIME DISTRIBUTION - WELL 16/3-2

TOTAL TIME: 640,0 HOURS

26,666 DAYS

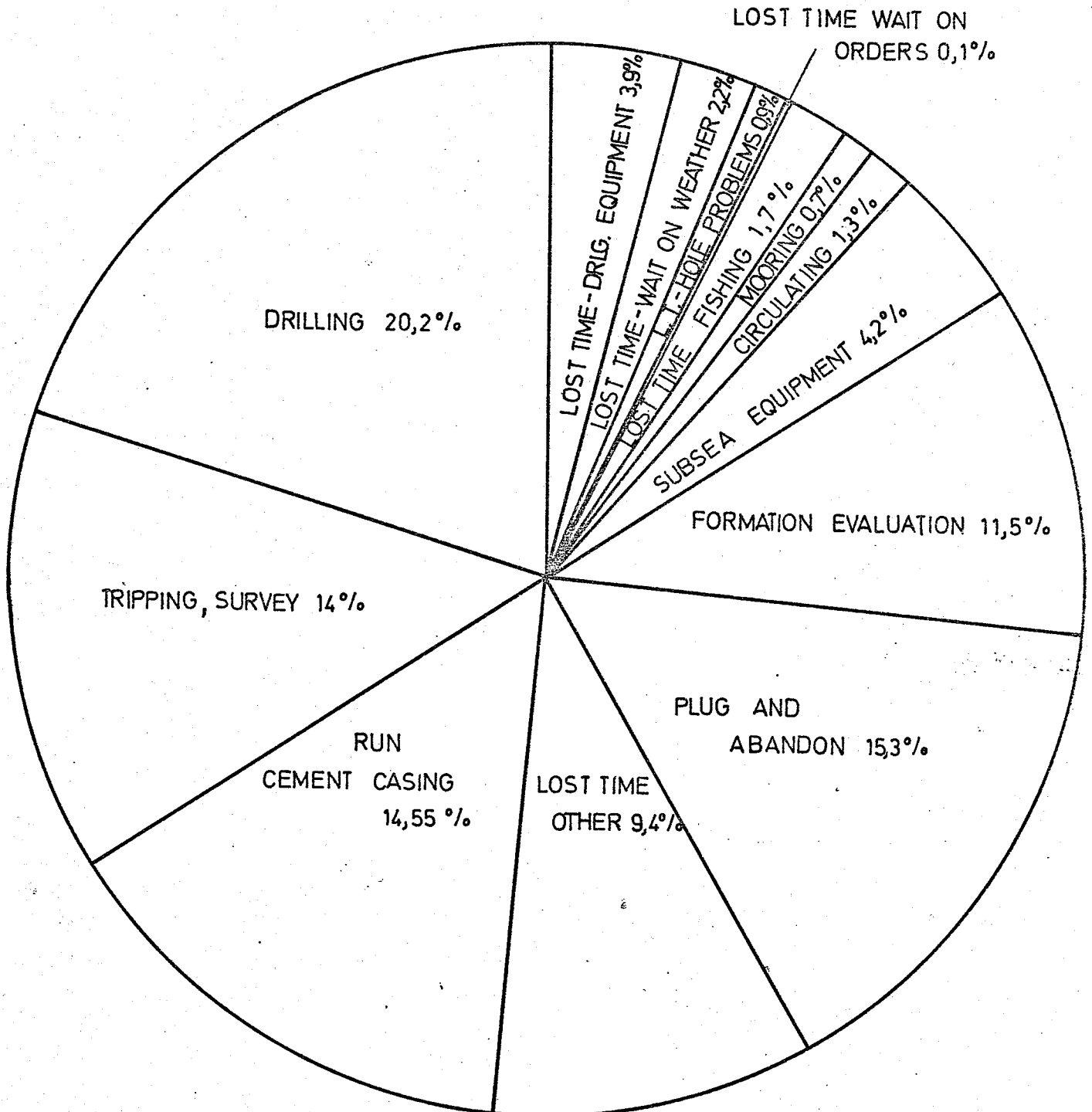


Fig. A3



ABANDONMENT PROGRAMME 16/3-2

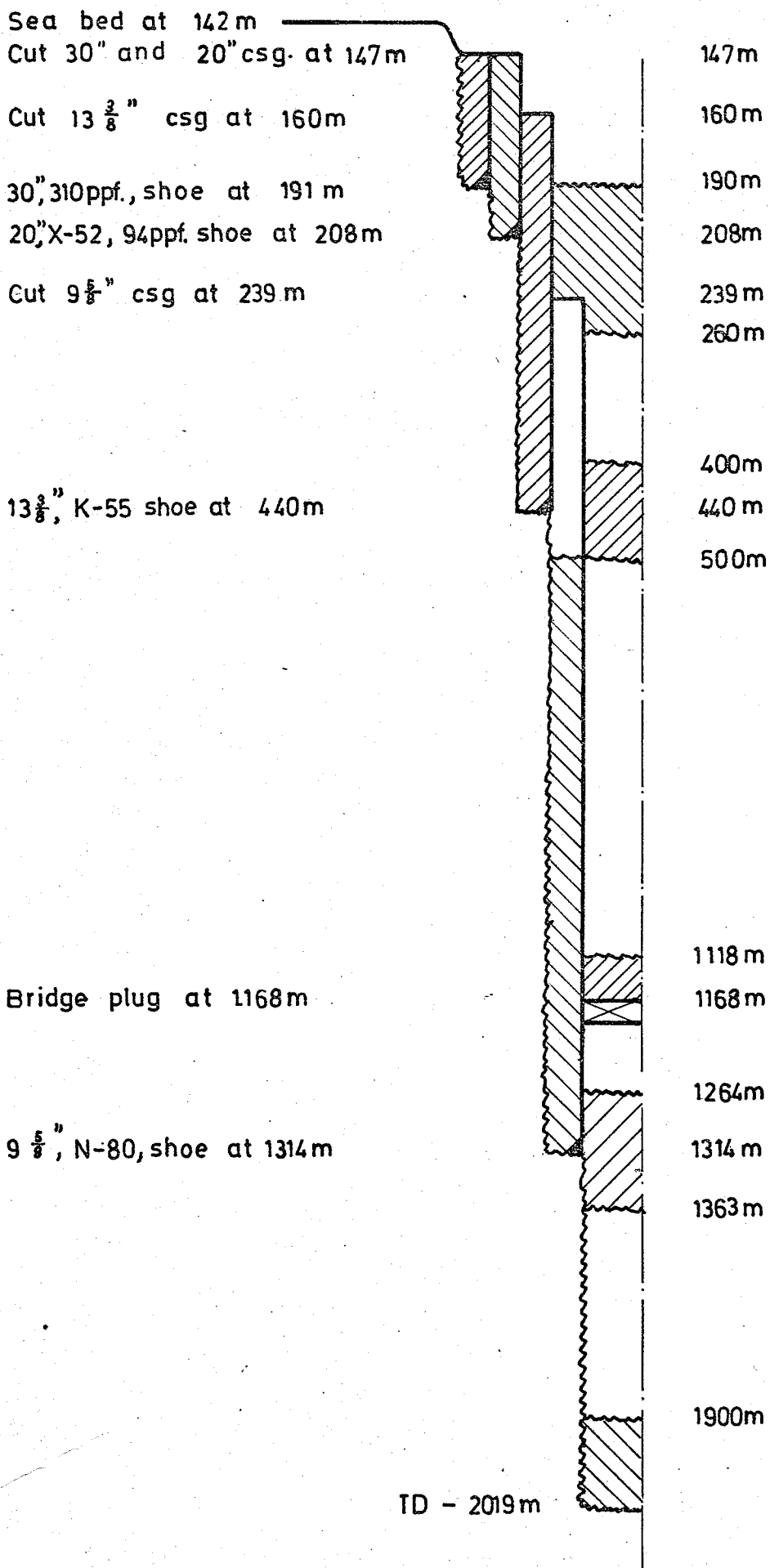


Fig. A.4

P.O. BOX 17, N-3501 HAUGESUND

Telephone: (047) 64 000 — Telex: 42 204 Knut N

Figure A.5

ORIGINAL

DIVE INSPECTION REPORT

(Dykker Inspeksjons Rapport)

Nr. 021

DATE (Dato) 7-3-76 TIME (Tid) 0930 CLIENT (Kunde) Hydro

DEPTH (Dyp) 380' VESSEL (Skip) Polyglomar Driller

DIVERS (Dykkere) B. Newport LOCATION (Posisjon) I6-3

EQUIPMENT (Utstyr) Bell (observation)

PURPOSE OF DIVE (Hensikt med dykket) To check if seabed is clear. Nothing was found.

-B-Lilleland

B. Newport Diver

*B. Lilleland*

*B. Newport*

NOTES ON OBSERVATION

RISER:

BOP:

HULL:

OTHER:

REPORTED BY:

S E C T I O N   B

G E O L O G Y

## CONTENTS

1. Objectives
2. Stratigraphy
3. Lithology
4. Core reports and description
5. Side wall cores
6. Hydrocarbon shows
7. Hole conditions
8. Logging

### Figures and tables

Fig. B1	core report no. 1
" B2	- " - 2
" B3	- " - 3
" B4	Side wall core description run no. 1
" B5	- " -
" B6	- " - no. 2 and 3
" B7	- " -
" B8	- " -

## 1. OBJECTIVES

The objectives of well 16/3-2 were:

### A. Paleocene

A possible channel sand development in Paleocene, located on an NNW - SSE anomaly on the  $C_2 - C_1$ , isopach. The closure is stratigraphic, with a possible shaleout to the south.

### B. Danian chalk

A slight disturbance on the chalk seismic marker at this location was thought to represent an improvement in reservoir characteristics.

### C. Jurassic sand

Sand development in the Jurassic is known from other wells, and a possible pinchout trap was thought to be present at this location.

Fair to good hydrocarbon shows have been reported at these levels in nearby wells.

## 2. STRATIGRAPHY

No stratigraphic or biostratigraphic reports have yet been received from the laboratories. The following stratigraphy is suggested from log correlation with adjacent wells.

Pleistocene - Miocene	837 m R.K.B.
Top Oligocene	837 m R.K.B.
Top Eocene	1.226 m R.K.B.
Top Paleocene	1.302 m R.K.B.
Top Cretaceous	1.471 m R.K.B.
Top Jurassic (hot shale)	1.955 m R.K.B.

Top Jurassic sand	1.972 m R.K.B.
Top Basement	2.006 m R.K.B.
T.D.	2.018,5 m R.K.B.

### 3. LITHOLOGY

#### 207 - 639 m R.K.B.

Mainly soft and unconsolidated clay with sand and silt. The clay is medium to dark gray and very sticky. In some places the clay is slightly calcareous. Silt and sand, very fine to coarse, are common throughout the section; sometimes the sand is subrounded and well sorted, often fine, otherwise it is unsorted, angular to subangular. Shell fragments and forams occur commonly in the more sandy intervals, and thin beds of lignite are common in the upper 100 m of the section.

#### 639 - 1227 m R.K.B.

A much more varied lithology is seen in this section. Basically this is a claystone and sand section with numerous thin limestone beds. The claystone is olive to brownish gray, soft and occasionally very plastic, (Gumbo Clay), often slightly silty and sandy with shell fragments. In the interval 900 - 1050 m R.K.B. pyrite is commonly seen. From 1050 m R.K.B. and downwards glauconite occurs in the silty claystone. A sandbed, (779 - 880 m R.K.B.), with a thin claystone horizon, consists of fine to very fine well sorted, subrounded to subangular, loose quartz sand, with dark green to greenish black glauconite and abundant shell fragments.

Thin limestone beds and/or calcite veins occur rather frequently in this section. The limestone is medium to dark brown to gray, sometimes beige and hard. The calcite varies in colour from dark brown to offwhite.

1227 - 1302 m R.K.B.

Mainly clay and claystone as above. At 1275 m R.K.B. an apple green claystone appears. Very small black spots are occasionally pigmenting the claystone. The apple green claystone is interbedded with rusty to brick red claystone.

1302 - 1344 m R.K.B.

The tuff interval, white to offwhite volcanic ash in a claystone matrix. The claystone matrix is medium to dark gray, possibly thin beds of green and red claystone.

1344 - 1465 m R.K.B.

Claystone with thin shales, medium gray to greenish gray with traces of sand and glauconite. Thin beds of lignite and veins of secondary calcite occur.

1465 - 1680 m R.K.B.

The chalk section, white to pinkish white chalk, soft to medium hard. Thin streaks of beige to light brown and hard limestone occur more frequently in the lower part. Pyrite occurs on solution features (stylolites?). At the base of the section, traces of sand with glauconite and thin shale beds appear to be present.

1680 - 1957 m R.K.B.

Marl and marlstone, light gray, soft to firm, often with traces of glauconite. Thin beds of chalk and limestone become less and less frequent downwards. The marlstone alternates with shale, medium to dark gray, often silty. Minute crystals of mica are seen in the shale. In a lower marlstone bed (1901 - 1957 m R.K.B.) disseminated pyrite is found.

1957 - 1972 m R.K.B.

Shale, dark gray to dark brownish gray. This shale is distinguished from the other shale beds by its brownish colour, and the fact that it is non calcareous and non silty.

1972 - 2006 m R.K.B.

Unconsolidated sand, coarse to very coarse grained, angular to subangular quartz. Two cores were cut in this interval, the first had no recovery due to the unconsolidated nature of the formation, the second recovered 1,8 m (24%). Thin beds of gravel cemented with calcareous material appear towards the base.

2006 - 2018,5 m R.K.B. (T.D.)

The upper 10 m consists of weathered granitic basement. A core was cut from 2017,5 - 2018,5 m R.K.B., and recovered unweathered granite basement.

#### 4. CORE REPORTS AND DESCRIPTIONS

A total of three cores was cut, two in the Jurassic sand. The first had no recovery while the second recovered approximately 1,8 m of coarse sand and gravel. The third core was cut to define and determine the basement. For detailed description see attached core reports (fig. B 1-3).



## 5. SIDE WALL CORES

Three guns of side wall cores were shot in the interval 470 - 2003 m R.K.B. In run no. 1 in the interval 470 - 1310 m R.K.B., 29 of 30 bullets were recovered (96,7%) but only 25 cores were accepted. Run no. 2 and 3 covered more or less the same interval, 1325 - 2003 m R.K.B. Both runs had full recovery but in run no. 2 only 25 cores were accepted and in run no. 3, 28 cores were accepted due to the quality of the recovered material.

All cores were shot for lithologic and paleontological control and none had any shows.

For detailed description see attached side wall core description (fig.B 4-8).

## 6. HYDROCARBON SHOWS

No hydrocarbon shows were reported from any section of the well. Background gas from the gas detector rarely exceeded 20 units (less than 1%).

Neither cuttings nor side wall cores or cores from the objective intervals showed any oilstaining or any indications of hydrocarbons being or having been present.

## 7. HOLE CONDITIONS

No problems arose during drilling due to abnormal hole conditions. The caliper log shows a remarkable enlargement of the hole in the chalk section. This is probably due to tool failure.

## 8. LOGGING

The following list covers logged intervals, log runs and dates.

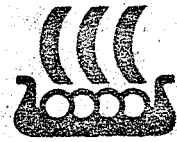
<u>LOG</u>	<u>DATE</u>	<u>INTERVAL</u>	<u>RUN NO.</u>
✓BHC-GR	19/2-76	141-1321 m R.K.B.	1
✓LES	19/2-76	440-1321 - " -	1
✓HRT	21/2-76	200-1148 - " -	1
✓BHC-GR	24/2-76	1314-1657 - " -	2
✓LFS	24/2-76	1314-1660 - " -	2
✓BHC-GR	29/2-76	1657-2019 - " -	3
✓LES	29/2-76	1657-2019 - " -	3
✓HDT	29/2-76	1314-2020 - " -	1
Velocity survey	1/3-76	10 shots	1

### Side wall cores:

CST	19/2-76	470-1310 - " -	1
CST	1/3-76	1325-2010 - " -	2
CST	1/3-76	1325-2010 - " -	3

# Norsk Hydro a.s

Oslo - Norway



Well no. <b>16/3-2</b>		<b>Core report</b>			Core no's <b>1</b>
Interval <b>1985 - 1998</b>		Area <b>Norwegian North-Sea</b>	Cut <b>13 m</b>		Date <b>28 - 2 - 76</b>
Scale <b>1 : 100</b>		Well R.K.B. <b>24 m</b>	Recovery <b>0 m</b>		Geologist <b>Rydberg</b>
Depth scale	Recovery	Lithological column	Depths	Lithological descriptions	Shows
				No recovery	
Well		Core report			Core no's

## Norsk Hydro a.s

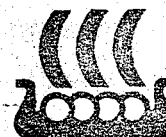
Oslo - Norway



Well no.		Core report				Core no's
16/3-2						2
Interval 1998 - 2006.5 m		Area Norwegian North-Sea		Cut 7.5 m	Date 28-2-76	
Scale 1:100		Well R.K.B. 24 m		Recovery 1.5 m	Geologist Rydberg	
Depth scale	Recovery	Lithological column	Depths	Lithological descriptions	Shows	
1998 1999				Sandstone: crs - v. crs loc gvl, ang - subang poor srt semicons, tr pyr, chlorite? sl mic. Grading to sst rnd - subrnd.  Recovery 24%	Nil	
Well		Core report				Core no's

# Norsk Hydro a.s

Oslo - Norway



Well no.		Core report			Core no's
16/3-2					3
Interval 2017 - 2019		Area Norwegian North-Sea		Cut 2 m	Date 29-2-76
Scale 1 : 100		Well R.K.B. 24 m		Recovery 1 m	Geologist Rydberg
Depth scale	Recovery	Lithological column	Depths	Lithological descriptions	Shows
2017 - 2018			+++++ +++++	Granite: pinkish with biotite, muscovite, quartz, and red-orange feklspar medium coarse grained.  Recovery 50%	Nil
Well		Core report			Core no's

SIDE WALL CORES DESCRIPTION

SERVICE COMPANY Schlumb.

ASKED: 30

RECOVERED: 29

SHOT: 30

LOST: 1

FULL BULLET: 21

WELL: 16/3-2

RUN N°: 1

LICENCE: 007

PAGE N°: 1

DATE: 20.2.76

GEOLOGIST:

tr : trace - M : medium - G : good

N°	DEPTHS	REC	LITHOLOGY	Fluorescence	
					CUT
1	1310		Clyst. grn-gy sft tr slt. Tuff white soft.		
2	1301,5		Clyst grn-gy sft tr mica. Pattern of dark mat. Bioturb.		
3	1298		Clyst rd-brn, rusty rd sft.		
4	1287		Clyst grn-gy, apple grn sft, spots of white mat. non calc. slightly slty.		
5	1275		Clyst grn-gy - brn-gy, sd & slt, tr glau, tr. micr. fos.		
6	1250		Clyst brn-gy slty calc micro lam.		
7	1230		Clyst brn gy - dk gy slt, calc micaceous sft.		
8	1200		Clyst brn - grn-gy slt micaceous sft calc.		
9	1175		Clyst a/a		
10	1150		Clyst brn-gy sft sticky calc slty		
11	1125		Clyst grn-gy slty v calc.		
12	1100		Clyst grn-gy - brn-gy sft sticky slty v calc.		
13	1075		Clyst a/a tr micro fos		
14	1050		Clyst dk gy v soft sticky v sl calc		
16	1000		Clyst dk brn gy sft pyr, shell frag lam micaceous		
17	975		Clyst a/a		
18	925		Clyst grn-gy v sft sticky slty sl calc		
19	925		Clyst a/a		



SIDE WALL CORES DESCRIPTION

SERVICE COMPANY	Schlumb.
ASKED:	60
RECOVERED:	53
SHOT:	60
LOST:	7
FULL BULLET:	53
GEOLOGIST:	Rydberg

WELL	16/3-2
LICENCE	007

RUN N°:	2 & 3
PAGE N°:	1
DATE:	1.3.76

tr : trace - M : medium - G : good

N°	DEPTHS	REC	LITHOLOGY	Fluorescence	
				CS	CUT
1	2003		Sd/sst. gtz, crs - v crs, ang - subang, w srted, poorly cmtd w calc cmt, glau		
1A	1994		Sst, qtz, crs - v crs, ang - subang, w srted, poorly cmt w calc cmt, glau		
2	1990		Sd, qtz, crs - v crs, w srted, loose, glau		
2A	1986		A/a		
3	1978		Sd, qtz, crs - v crs, loc gravel, loose, poorly srted, sl. glau		
3A	1973		Sh, dk gry - dk brnsh gry, w ind. frm, fis, loc micro-pyr, noncalc.		
4	1969		A/a		
4A	1967		A/a		
5	1965		A/a		
5A	1963		A/a		
6	1961		A/a		
6A	1959		A/a		
7	1957		Mainly a/a but sl sfter		
7A	1952		Mrlst. frm, lt gry, sl slty.		
8	1948		Mrlst/Mrl, v lt gry, sft, ab disseminated pyrite		
8A	1934, 5		Sh, gry - m dk gry, fis, sl calc.		
	1906		Mrlst, m frm, redbrn, micromic		
9A	1904		A/a		



SIDE WALL CORES DESCRIPTION

SERVICE COMPANY Schlumberger	
ASKED:	60
RECOVERED:	53
SHOT:	60
LOST:	7
FULL BULLET:	53
GEOLOGIST: Rydberg	

WELL:	16/3-2
INCENCE:	007

RUN N°:	2 & 3
PAGE N°:	2
DATE:	1.3.76

tr : trace - M : medium - G : good

N°	DEPTHS	REC	LITHOLOGY	Fluorescence	
					CUT
0	1894		Sh, m dk gry, frm, v sl slty, micromic, calc.		
			A/a		
11	1850				
1A	1831		Sh, gry, frm - hd, sl slty, micromic, calc.		
			Mainly a/a - sl sfter		
2	1811				
12A	1774		Mrlst, v lt gry, frm, sl glau.		
13A	1744		Sh dk gry, v sl slty, calc, fis, frm-hd.		
			A/a		
4	1735				
4A	1725		Sh, lt gry, slty - sl slty, frm, calc.		
			A/a		
15	1713				
			A/a		
5A	1709				
			A/a		
6	1696				
			A/a		
16A	1688				
			Chalk, wh - v lt gry, glau, frm		
17	1665				
			A/a		
7A	1650				
			A/a		
18	1635				
			A/a		
18A	1635				
			A/a		
19	1605				
			A/a		
9A	1575				
			A/a		

SIDE WALL CORES DESCRIPTION

SERVICE COMPANY	Schlumb.
ASKED:	60
RECOVERED:	53
SHOT:	60
LOST:	7
FULL BULLET:	53
GEOLOGIST:	Rydberg

WELL:	16/3-2	RUN N°:	2 & 3
LICENCE:	007	PAGE N°:	3
		DATE:	1.3.1976

tr : trace - M : medium - G good

N°	DEPTHS	REC	LITHOLOGY	Fluorescence	
					CUT
0	1550		Chalk, wh - v lt gry, glau, frm		
			A/a		
20A	1530				
			Chalk a/a w/stylolites filled w/pyrite		
21A	1490				
			Sh, gry, sft, calc		
22	1480				
			Mrlst/marly Sh, lt gry, calc. tite, chalky		
22A	1468				
			Sh, dk gry, v sl calc		
23	1455				
			A/a		
23A	1450				
			A/a		
24A	1430				
			Sh/clyst, gry, m sft, v micromic, pyr, calc, frm		
25	1420				
			A/a		
25A	1413				
			A/a		
	1400				
			Sh. gry - dk gry, w ind - frm, fis noncalc.		
27A	1375				
			A/a		
28	1370				
			A/a		
28A	1360				
			A/a		
29	1350				
			Sh, gry-dk gry, slty, fis, micromic, noncalc.		
29A	1339				
			A/a		
30A	1325				