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NSEP 246

84 85-3406-1

EXPLORATION WELL RESUME

Well 1/3-5

A/S Norske Shell, Forus
July 1985

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GENERAL INTRODUCTION

Production Licence 011 (Blocks 1/3a and 1/6a) was awarded to Norske Shell (100%) in 1965 during the First Concession Round. Two statutory relinquishments in 1971 and 1974 and one voluntary relinquishment in 1976 left only 500 sq. km. of the original licence. There are no outstanding relinquishment and/or work obligations for the licence, which expires in August 2011.

Six exploration wells to test the Chalk have been drilled in the two blocks. The Albuskjell Field straddles the boundary of Blocks 1/6 and 2/4 and is currently being produced by the Phillips/Shell Group.

The prospect drilled by well 1/3-5 lies mainly in Norske Shell's Blocks 1/3a and 1/6a, with an extension into Blocks 2/1 (BP/Statoil/Conoco/Pelican Group) and 2/4 (open). Well 1/3-5 was spudded on 01.10.1984. It was plugged and abandoned on 10.02.1985 after reaching TD at a depth of 4850 m BDF in rocks of Permian age.

The main objective, the Rotliegendes sandstone, was found to be waterbearing.

Well 1/3-5

Summary of Well Data:

Well Classification:	Wildcat
Location Coordinates:	E 56° 46' 16.02"
	N 02° 53' 38.85"
Water Depth:	70 m
Derrick Floor Elevation:	36.3 m
Contractor/Rig:	Neddrill/"Neddrill Trigon"
BOP-Stack:	Cameron Iron Works 15000 psi wellhead equipment 20 3/4" 3000 psi and 13 5/8" 15000 psi
Mudlogging Contractor:	Exlog
Start of Operations:	01/10/84
Spudded:	01/10/84
Completed:	10/02/85
Objective:	To evaluate the hydrocarbon potential of the Rotliegendes Group Sandstones in a large tilted fault block extending from Norske Shell's Blocks 1/3a and 1/6a into Blocks 2/1 and 2/4.
Total depth:	Driller's depth 4850 m (logger's depth 4851 m). All depths reported below derrick floor (bdf) unless otherwise specified.
Formation at TD:	Rotliegendes Group (Permian)
Results:	Weak oil shows in the upper part of the Tor (Maastrichtian) Fm. Occasional weak gas shows in the "Lower" Chalk. Rotliegendes reservoir was found to be water-bearing. No production tests were carried out.
Total Costs Estimate:	125.229.000 NOK
Present Status:	Plugged and abandoned as a dry hole with hydrocarbon shows.
Casing Record:	36" csg : 168 m
	20" csg : 1183 m
	13 3/8" csg: 2443 m
	9 5/8" csg: 4122 m
	7" liner : 4395 m

Logs:	DIFL/ACL/GR/SP	
	CDL/CNL/GR/CAL)	
	DLL/MLL/GR/CAL)	
	FMT)	partial well
	ACBL/VDL)	coverage
	Dip Log)	
	Temperature Logs)	
	VSP	
Cored Interval:	4805 - 4814 m (1 core)	
Sidewall Samples:	Attempted: 97	
	Recovered: 65	

PART I

DRILLING AND ENGINEERING REPORT

I.1. DRILLING HISTORY - WELL 1/3-5

The Neddrill Trigon arrived on location 1/3-D at 20:00 hrs on 22.09.84. The final position of the rig (established after 49 satellite passes) was:

N 56 deg 46' 16.02"
E 02 deg 53' 38.85"

The rig was jacked up to a 20.4 m airgap at 13:30 hrs on 23.09.84 and maintenance and modifications were then carried out on the rig in preparation for drilling. The rig contract commenced at 05:00 hrs on 1.10.84 when the rig was handed over to A/S Norske Shell.

The well was spudded at 09:30 hrs on 1.10.84 and the following distances established:

Seabed 106.3 m BDF
Water depth 70.0 m (MSL)

The 36" hole was drilled to 160 m (½ deg hole angle), displaced to viscous mud and a check trip performed before rigging up to run the 36" conductor. The conductor was driven to refusal point at 162 m (372 blows/ft), and the interval from 120 - 160 m washed and reamed before drilling 26" hole from 160 - 169 m. The conductor was subsequently driven a further 6 m to refusal at 168 m. The top of the 36" conductor was rough cut at 1.35 m above the cellar deck and after repositioning the top tension clamp 5 m above sea level the 36" x 30" cross over was welded on and the diverter and flowline installed.

A 14-3/4" pilot hole was drilled to 1195 m in two bit runs through soft clays and sands using gelled seawater with viscous pills to sweep the hole clean. (The deviation at TD was 0.25 deg). After displacing the hole to viscous mud, Dresser Atlas ran the following log:

DIFL/BHC-ACL/GR/SP (Run no. 1)

The pilot hole was then opened up to 26" using a hole opener to 345 m and a 26" bit down to 1195 m. While drilling, the hole was again swept clean with high viscosity pills, and surveys every 100 m indicated no build-up of angle. The hole was displaced to viscous mud prior to running:

4-arm Caliper/GR (Run no. 1)

The caliper indicated several undergauge sections, thus a check trip was made and the hole conditioned before rigging up to run 20" casing. 84 joints of Vetco X-52, 20", 129 lb/ft LS-LH and 10 joints of LS-RH were run in 21 hours to 1183 m, with the top of the mudline suspension hanger at 104.06 m BDF. The casing was successfully cemented while continually flushing the 36" x 20" annulus with seawater via hoses strapped to the outside of the 20" casing. The annulus was later displaced to inhibited seawater. Dresser Atlas was rigged up and ran:

Temperature log (Run no. 1) (20" cemented to seabed)

After releasing the tension on the casing it dropped 18 cm, leaving the top of the 20" WF housing at 14.78 m BDF. The 20-3/4" 3000 psi BOP was then flanged up and tested.

After drilling out the plug, float and shoe track, the hole was displaced to KCl/polymer mud of 1.25 SG. 5 m of new hole was drilled and a leak-off test was performed to a maximum equivalent mud weight of 1.80 SG. The test was repeated for confirmation, to a maximum equivalent mud weight of 1.77 SG. The 17½" hole was drilled to 1391 m incorporating a Gearhart Geodata MWD directional tool in the drillstring, where a build-up angle of 1.5 degrees was recorded by the MWD tool. The bit was then tripped in order to change the BHA.

The mud weight was raised incrementally (in response to the pore pressure estimation) to 1.70 SG by 2042 m. The rapid addition of barite and high volumes of drilled solids in the mud from the fast penetration rates, resulted in excessively high mud rheological properties. The mud was conditioned and a problem free wiper trip performed, with drilling rate subsequently being controlled. However, when the penetration rate again increased, severe rheological problems once more developed in the mud system and drilling was halted at 2147 m while the mud was conditioned.

17½" hole was drilled to 2470 m, while continually diluting the mud system. Owing to mud problems (12 hours of conditioning were required at 2470 m) and pipe drag on connections, it was decided to set the 13-3/8" casing 40 m higher than originally planned. Accordingly several wiper trips were made before tripping out of the hole. Dresser Atlas was rigged up and ran:

DIFL/BHC-ACL/GR/SP	(Run no. 2)
4-arm caliper/ GR	(Run no. 2)

A check trip was made prior to running 196 joints of 13-3/8" 72 lbs/ft C95 BDS casing to 2443 m. The mudline suspension hanger would not initially pass through the weld at the top of the 20" casing, so the loadring on the hanger had to be turned down from 18.51" to 18.25" diameter. The casing was thereafter landed, successfully cemented and pressure tested to 3000 psi after bumping the cement plug.

The 20-3/4" BOP was nippled down, the casing cut, and the adaptor spool, the casing head spool, and 13-5/8" 15.000 psi BOP stack flanged up and successfully pressure tested. While working on the wellhead, water flow was observed from the 13-3/8" x 20" annulus (decreasing from 8 to 3 litres/ minute in 12 hrs), and gas bubbling was observed in the 20" x 36" annulus. 1.10 SG mud was pumped down the 36" x 20" casing annulus to prevent further gas bubbling, and flow from the 20" x 13-3/8" casing annulus continued to decrease until flow finally stopped.

The 13-3/8" casing was tested to 4500 psi, a 12-1/4" bit was run, and the 13-3/8" shoe track and 5 m of new hole drilled, before performing a leak-off test to a maximum equivalent mud weight of 1.84 SG. This leak-off value was doubted and the test was repeated to a maximum equivalent mud weight of 1.91 SG.

The upper section of the 12-1/4" hole consisted of claystone and was drilled without problems using a KCl-polymer mud of 1.70 SG. Below approximately 3000 m the mud was lightly treated with lignosulphonate and the KCl level allowed to fall back while drilling ahead through chalk lithologies.

50 tons overpull was recorded during a 5 stand wiper trip at 3496 m and while tripping at 3563 m overpull again occured and the drillstring stuck with the bit at 3515 m. It was possible to jar up and down with full circulation, but without rotation, thus indicating a probable stuck point at a stabilizer in the BHA. A 130 bbl pipelax pill was mixed

(containing 275 gallons pipelax and with a mud/ diesel ratio of 1:1) and 50 bbls spotted around the drill collars. After working the pipe and displacing the pipelax pill 1 bbl every half hour the pill was circulated out and a new pill respotted, again without success.

23 bbls of 15 % hydrochloric acid was subsequently pumped with 1 bbl water spacer ahead and behind, spotting 20 bbls around the BHA for five minutes, before slowly displacing the acid pill to above the top stabilizer at 3347 m. After jarring for fifteen minutes the string became partially free with 5 m of vertical movement, but without rotation. The pipe was worked until two singles were laid out and the pipe could rotate freely. The spent acid was circulated out through the choke manifold and 88 bbls of returns dumped. While pulling out a maximum of 35 tons overpull was recorded up to 3120 m. A total of 43 hrs were lost due to the stuck pipe.

The 13-5/8" 15.000 psi BOP stack was tested satisfactorily and the BHA changed to a more flexible assembly before drilling ahead. Only light reaming was required prior to resuming drilling. The Gearhart MWD tool failed below 3576 m and was laid out after tripping at 3628 m. As the back up tool failed at surface subsequent surveys were taken with single shot instruments.

The 12-1/4" hole was drilled to casing setting depth at 4138 m with one further bit run (a stratapax PD-3T made 510 m of hole in 130.5 hours). Surveys taken throughout the section indicated the hole inclination to be generally less than a degree from vertical. The mud weight was increased in stages from 1.70 SG to 1.80 SG by the end of the hole section, in line with an increase in the estimated pore pressure to a maximum of 1.76 SG at TD.

Dresser Atlas was rigged up and ran:

DIFL/BHC-ACL/GR/SP	(Run no. 3)
CDL/CNL/CAL/GR	(Run no. 1)

When the second logging tool was pulled out of hole, after having failed at 2675 m, the spring de-centralizer on the neutron tool was observed to have been lost downhole.

Dresser Atlas was rigged down and an 11-3/4" reverse circulating junk basket run to fish the de-centralizer from the wellbore. The decentralizer was successfully recovered and the remaining junk in the hole, (consisting of half a box spring and guide), was milled out during a check trip. Dresser Atlas was then again rigged up and ran:

FMT	(Run no. 1)	42 pre-tests attempted
CBL/VDL-GR	(Run no. 1)	On 13-3/8" casing

After logging, the top pipe rams were changed to 9-5/8" casing rams and the block line reeved to 12 lines. The casing rams were tested satisfactorily, and following a further check trip the mud line suspension system in the 13-3/8" casing was cleaned out prior to rigging up to run the 9-5/8" casing. 341 joints of 53 lb/ft P-110 BDS casing were run and cemented with the shoe at 4122 m.

While waiting on cement the 9-5/8" - 13-3/8" annulus was observed to be flowing cement contaminated mud at an initial rate of 1000 litres/hour, which decreased to an average of 300 litres/hour after 3 days. When the annulus was closed in, pressure repeatedly built up to 400 psi after being bled off, and flow continued despite attempts to inject 2.0 SG

mud. The annulus was allowed to flow and returns were constantly monitored during subsequent operations.

After waiting on cement and reeving the block line back to 10 lines, Dresser Atlas was rigged up and ran:

Gyrosurvey (Eastman) (Run no. 1)

The 13-5/8" 15000 psi BOP stack was then nippled down, the 9-5/8" casing cut and the HRD casing spool and lock down flange installed and pressure tested. The BOP was nippled up and following a successful pressure test, a bit and scraper run was made before testing the surface casing to 5000 psi using an RTTS packer set at 2300 m. The plugs and shoe track were then drilled out to 4107 m, and in order to locate the top of cement due to concern at the continuing 9-5/8" x 13-3/8" annulus flow (+/- 300 litre/hour at that stage), Dresser Atlas was rigged up and ran the following logs:

CBL/VDL/GR	(Run no. 2)	
Temperature log	(Run no. 2)	TOC estimated at +/- 1750 m

Operations continued, constantly monitoring the annulus flow.

The remaining shoe track and 9 m of new hole were then drilled and a leak-off test was carried out to a maximum equivalent mud weight of 2.12 SG.

The 8½" hole section was drilled with a polymer/ sulphonated resin mud with an initial weight 1.80 SG, using two stratapax bits in predominantly chalk lithologies. Mud weight was raised incrementally in response to evidence of increasing pore pressure and a weight of 2.00 SG was reached by 4300 m. Below this depth mud reology deteriorated dramatically due to cement contamination of the barite used to weight up the system. Drilling was halted at 4329 m and the mud was treated for 12 hours before making a bit trip and BOP stack test. 45 MT of contaminated barite was dumped from the silos.

When drilling resumed a high trip gas of 62 % and rapid rises in background gas indicated a continued increase in pore pressure with depth, and mud weight was raised further to 2.08 SG by 4395 m. With only 200 psi kick tolerance safety margin remaining at the 9-5/8" casing shoe with the static mud weight it was planned to log and set a 7" liner.

While waiting on logging tools the hole was conditioned and 7 hours were spent waiting on weather to offload the tools. Dresser Atlas was then rigged up and ran the following logs:

DIFL/BHC-ACL/GR/SP	(Run no. 4)
HDT	(Run no. 1)
CDL/CNL/CAL/GR	(Run no. 2)
MLL/DLL/CAL/GR	(Run no. 1)

A check trip was made and 105 % gas recorded at bottoms up, before running:

FMT	(Run no. 2)	31 pretests
FMT	(Run no. 3)	2 samples
MLL/DIL/CAL/GR	(Run no. 2)	
COR GUN	(Run no. 1)	14 shots recovered, 6 lost, 5 misfired)

A further check trip was made with a junk sub and 104 % gas recorded at bottoms up. 31 joints of 35 lb/ft 7" P-110 BDS casing were then run on drillpipe and set with the shoe at 4395 m, landing collar 4361 m, top liner hanger slips 3983 m and top of polished bore receptacle 3977 m. The liner was cemented and plug bumped with 1500 psi. A leak off test performed on the cement gave a maximum pressure of 930 psi, stabilizing at 780 psi with a mud weight of 2.08 SG. This pressure was maintained until the cement hardened.

An 8½" bit was run to clean out the cement above the liner and the 5" drillpipe and BHA were then laid down. After changing the rams to 3½" the 13-5/8" 15000 psi BOP stack was pressure tested and a 5-7/8" bit, 4-3/4" BHA and 3½" drill string picked up. The flapper valve was tagged at 3981 m, and drilled out. Following an obstruction at 4040 m the drill string was washed down to the landing collar at 4361 m.

The 9-5/8" casing - 7" liner was pressure tested to 3000 psi and a 7"/ 9-5/8" casing scaper assembly run. An RTTS retrievable packer was run, and following three pressure test failures at 280 m, it was run to 700 m where the annulus was tested successfully to 3000 psi. The RTTS was further run to 3927 m, set, and pressure tested to 2000 psi. After opening the circulation valve, and pressure testing surface lines to 5000 psi, 54 bbls of water was pumped, the packer set, and surface pressure bleed off. An inflow test was performed, satisfactorilly, applying a draw down of 2000 psi at the 9-5/8" casing shoe based on a formation pressure of 1.78 SG at that point. The pipe was then redisplaced to mud, and the string pulled.

A 5-7/8" bit was run, the shoe track drilled from 4361 to 4395 m, and new formation to 4400 m. The hole was circulated clean and a formation integrity test carried out to a limited equivalent mud weight of 2.33 SG. Drilling resumed and a new formation was drilled to 4401 m where progress stopped, and the string pulled, 1 lb of junk being retrieved. The bit was changed and new formation drilled to 4423 m, with maximum bottoms up gas of 7.7 % and background gas 5 %. The mud weight was further increased to 2.11 SG. The string was again pulled, 1½ lbs junk retrieved, and a new bit was run.

The 9-5/8" x 13-3/8" annulus flow, having been +/- 60 litres/hour at the end of the 8½" hole section, gradually decreased and ceased completely. The total production was estimated to be 74.64 cum.

Drilling of 5-7/8" hole continued to 4710 m using mainly stratapax bits whereon Dresser Atlas were rigged up and ran the following intermediate logs:

DIFL/BHC-ACL/GR/SP	(run no. 5)
VSP (SSL)	(run no. 1)

The VSP indicated close proximity to the anticipated dolomite marker overlaying the reservoir and drilling continued intermitantly, frequently stopping whilst circulating for samples. The top of the reservoir was penetrated, however, at 4767 m without apparently encountering the dolomite marker. Drilling was continued to 4805 m when Dresser Atlas were rigged up and ran the following logs:

DIFL/BHC-ACL/GR/SP	(run no. 6)
CNL/CDL/GR/CAL	(run no. 3)

During the first CNL/CDL run the CDL failed and the back up tool was run, however the pulse code modulator failed during this run. A third run of the CNL/CDL was completed successfully.

A wiper trip was required at this point in the logging programme, and a core barrel was run, enabling a core to be cut as follows:

Core no. 1 4805 - 4814 m (Recovery 100 %)

Dresser Atlas were again rigged up and ran:

MLL/DLL/GR/CAL	(run no. 3)	
HDT	(run no. 2)	
FMT	(run no. 4)	11 pretests
FMT	(run no. 5)	8 pretests
FMT	(run no. 6)	4 pretests

Drilling was resumed for a further 36 m to final TD at 4850 m, and after performing a check trip and conditioning the hole, Dresser Atlas were rigged up and ran the following logs:

MLL/DLL/GR/CAL	(run no. 4)	
CNL/CDL/GR/CAL	(run no. 4)	
FMT	(run no. 7)	Sample and pretests
CORGUN	(run no. 2)	12 recovered, 10 lost
CORGUN	(run no. 3)	39 recovered, 8 lost, 2 misfired, 1 empty

Having completed the final logging programme Dresser Atlas were rigged down and preparations made for abandoning the well.

A 200 m 2-7/8" tubing stinger was run in on drill pipe and after circulating the string capacity + 10 % abandonment plug no.1 was set over the interval 4845 - 4695 m in open hole. The cement flash set while pulling back out of the plug and the tubing parted with 70 tons overpull. After circulating clean the string was retrieved leaving 194 m of tubing downhole, with the top of the fish at 4554 m.

A new cement stinger was made up using a combination of the remaining 2-7/8" and 2-3/8" tubing available and a full circulation performed before setting plug no.2 from 4640 - 4490 m. 10 tons overpull occurred on the first stand while pulling back to 4432 m after displacing, and 1000 psi was required to break circulation. Plug no.3 was set over the top of the open hole section into the 7" liner from 4432 - 4275 m, and overpull of 5 tons again occurred on the first stand while pulling back to 4228 m, and 1500 psi was required to break circulation.

Pressure tests were carried out on the casing annuli. The 9-5/8" - 13-3/8" annulus was tested satisfactorily to 3500 psi, and the 20" - 13-3/8" annulus to 1100 psi.

A 5-7/8" bit and 7" casing scraper were run and the top of cement plug no.3 tagged at 4242 m with 15.000 lbs, and the plug tested to 1500 psi.

A bridge plug was set at 4026.5 m inside the 7" liner following a gauge ring/ junk basket run. Cement plug no.4 was set from 4025 - 3875 m, covering the 7" liner hanger. The plug was located at 3900 m and weight tested with 15000 lbs weight. Dresser Atlas was rigged up again and ran a gaugering/ junk basket to 3901 m. While pulling out, the cable broke at 1967 m, and the tool was left behind down hole. A bit and scraper run was subsequently made to 3896 m. Thereafter Dresser Atlas set a 9-5/8" bridge plug at 3875 m. A CBL/VDL/GR run was made from 2502 - 100 m, showing traces of cement upto 150 m BDF.

An RTTS packer was run to 900 m, but it was not possible to pressure test the packer due to loose connections in the string. The packer was

pulled, and all connections checked while running in. The packer was set at 3800 m and the DP displaced to seawater down to 2175 m, thereby applying an effective gradient of 1.5 SG at the plug in the casing. No inflow was observed and the 3½" drillstring was laid down whilst POH with the packer. Dresser Atlas was then rigged up and a 9-5/8" bridge plug set at 2395 m. 5" drillpipe was picked up and run in to 2395 m and the hole circulated to 1.7 SG mud. A 9-5/8" casing cutter was run to 2345 m and the 9-5/8" casing was cut and milled down to 2348.5 m. Following the cutting, the 9-5/8" x 13-3/8" annulus was tested to 3500 psi. Cement plug no.5 was set from 2391 - 2190 m and the stinger pulled back. 4-1/8 bbls of cement were squeezed into the 9-5/8"/ 13-3/8" annulus through the milled window by applying 2000 psi surface pressure giving a theoretical TOC at 2210 m. A bit and scraper run was made and hard cement found at 2337 m.

Consequently, cement plug no.6 was set from 2334 - 2135 m. This plug was located at 2105 m and weight tested to 15000 lbs and pressure tested to 2000 psi during a bit and scraper run. An RTTS packer was run to 900 m and a lubricator and BOP made up. Dresser Atlas was rigged up and RIH with a 2" perforation gun. The 9-5/8" casing was perforated under pressure control from 1000 m - 999.4 m using 8 shots.

Circulation was established down the DP through the perforations, and up the 13-3/8" x 9-5/8" annulus and the annulus was displaced to seawater and circulated clean. A maximum gas of +/- 20 % was encountered. An inflow test was successfully performed by observing the water filled annulus before the seawater was circulated out and the annulus redisplaced to 1.7 SG mud. The RTTS packer was pulled out of the hole, Dresser Atlas was rigged up, and set a 9-5/8" bridge plug at 1050 m.

After having changed the variable rams to 5" pipe rams, the BOP was nippled down and pulled free with a maximum overpull of 40 tons. The 7" HRD spool was nippled down, the diverter installed, and the adapter flange and upper piperams successfully tested.

A 9-5/8" casing cutter was run in the hole, and the 9-5/8" casing was cut at 1001 m. The casing was pulled free with 90 tons overpull, pulled out of the hole and laid down. Cement plug no.7 was set from 1045 - 895 m. A 12-1/4" bit and 13-3/8" casing scraper were run and the plug located at 875 m, and successfully weight tested with 15.000 lbs and pressure tested to 2000 psi. Dresser Atlas was rigged up, and set a 13-3/8" bridge plug at 855 m.

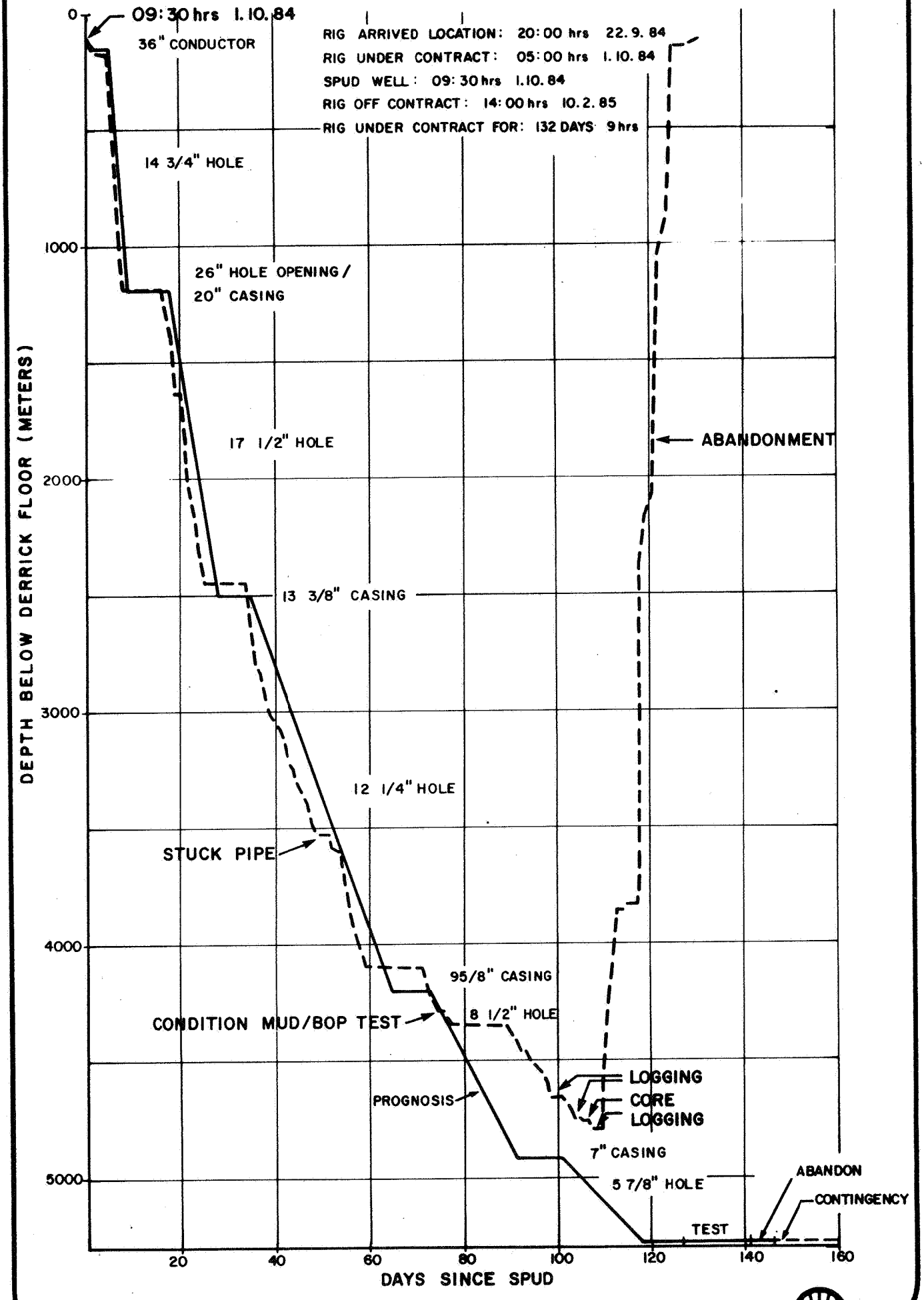
A cement stinger was run in the hole to 400 m, and a 40 bbl high-viscosity pill was spotted from 400 to 320 m. The stinger was pulled back to 350 m and the hole was circulated clean before cement plug no.8 was set from 350 - 130 m. The stinger was pulled back to 116 m, and the hole was displaced to seawater. The stinger was laid out, and the 13-3/8" BOP stack was nippled down and installed on the stump. The top of cement plug no.8 was located at 121.5 m with a 12-1/4" bit and successfully weight tested with 15000 lbs. A 13-3/8" casing cutter was run and the casing cut at 113 m. With 90 tons overpull the casing could not be worked free. The 13-3/8" and 20" casings were then recut at 113 m and pulled simultaneously 1 ft with an overpull of 110 tons. After having nippled down the diverter housing, the 20" - 13-3/8" annulus was reverse circulated and the same casings were pulled with a maximum overpull of 110 tons.

A 36" casing cutter was run in the hole, and the casing was cut at 111 m. With 50 tons overpull an abortive attempt was made to pull the casing free. The casing was then recut at 110 m, and successfully

pulled free with 90 tons overpull. The casing was pulled and laid down, it was necessary to flame cut every joint, because the connections could not be unscrewed. All remaining DP was laid down, and the diverter housing was installed and the 13-3/8" BOP skidded. Preparations were made to skid the derrick, but the operation was delaid for 6 hours because the cranes could not clear the deck due to bad weather.

At 14.00 hrs the 10th of February 1985 the skidding was completed, and the contract with A/S Norske Shell was ended.

1/3-5 DRILLING PROGRESS CURVE



A/S NORSKE SHELL

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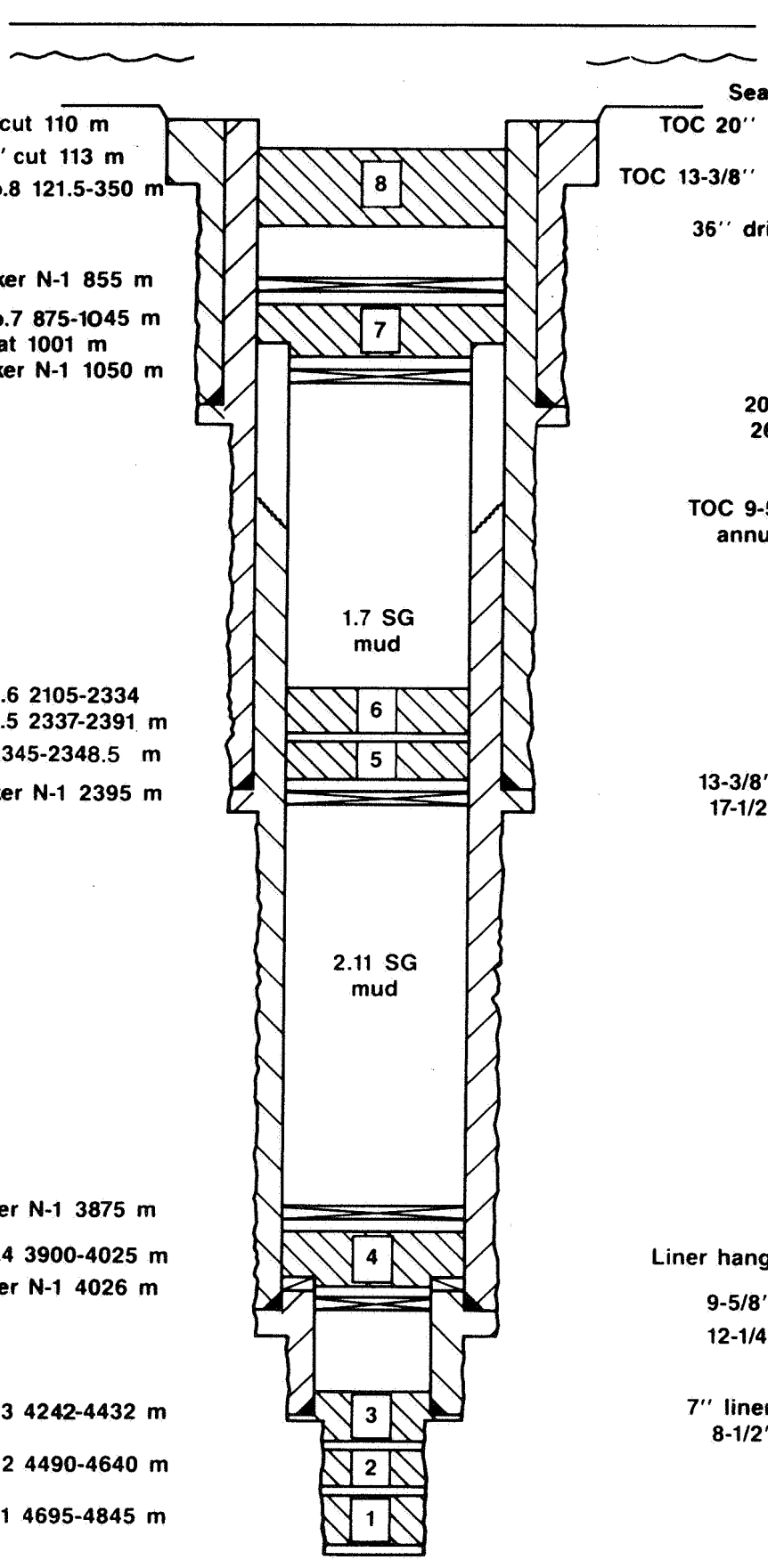
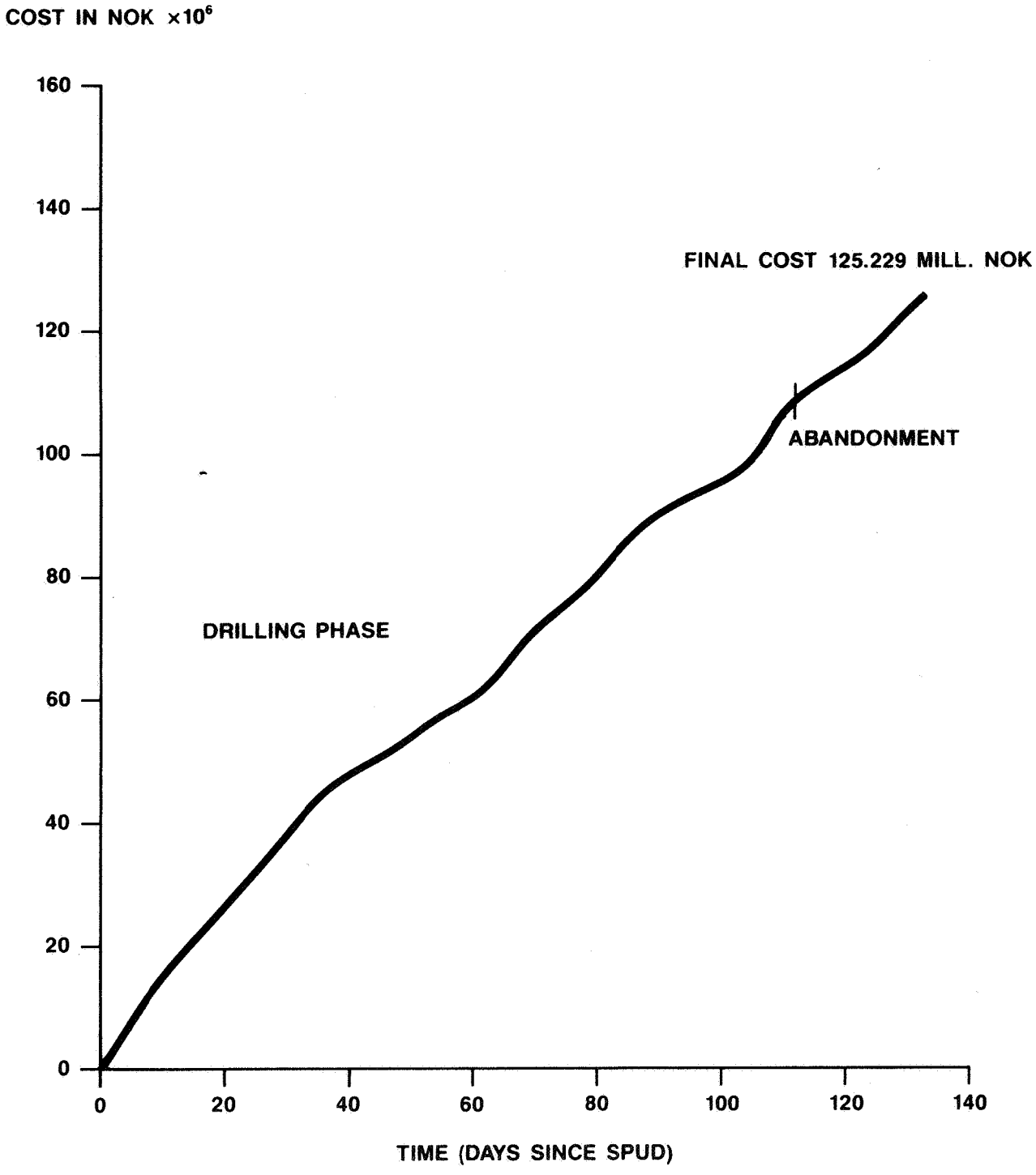
ABANDONMENT DIAGRAM WELL 1/3-5



N.B: All depths quoted BDF

A/S NORSKE SHELL

TIME/COST CURVE 1/3-5



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FORMATION LEAK OFF TEST DATA WELL 1/3-5

NO.	DATE	CASING		HOLE		MUD Wt. IN USE	MAX.EQUIVALENT MUD Wt.	REMARKS
		SIZE (")	DEPTH (M)	SIZE (")	DEPTH (M)	SG	SG	
1	17.10. 1984	20	1183	17½	1200	1.25	1.80	Pumped 10½ bbls. 6 bbls returned,4½ bbls lost to formation.
2	17.10. 1984	20	1183	17½	1237	1.25	1.77	Pumped 6½ bbls. 5 bbls returned, 1½ bbls lost to formation.
3	03.11. 1984	13-3/8	2443	12-1/4	2475	1.70	1.84	Pumped 3-1/4 bbls, 2-3/4 bbls returned, ¼ bbl lost to formation.
4	03.11. 1984	13-3/8	2443	12-1/4	2475	1.70	1.91	Pumped 4½ bbls, 4 bbls returned, ½ bbl lost to formation.
5	14.11. 1984	13-3/8	2443	12-1/4	2475	1.70	1.91	Pumped 4 bbls, 3½ bbls returned, ½ bbl lost to formation.
6	11.12. 1984	9-5/8	4112	8½	4147	1.80	2.12	Pumped 4 bbls, 4 bbls returned.
7	23.12. 1984	9-5/8 - 7	-	-	-	2.08	-	Test performed on setting cement above top of the 7" liner at 3976 m inside 9-5/8" casing. Leak pressure 930 psi stabilising at 780 psi. Pumped 2-5/8 bbls, returned 2-5/8 bbls.
8	30.12. 1984	7	4395	5-7/8	4400.5	2.08	2.33	Stopped test at this stage on advice from town. Leak off not yet reached. Max surface press: 1550 psi. Pumped 3-1/8 bbls mud, returned 3-1/8 bbls mud.

A/s NORSKE SHELL

TABLE.I.1

G.1884/8

CASING DATA WELL NO 1/3-5

DATE RUN	SIZE	GRADE	WT/FT (LBS)	COUPLING	SHOE DEPTH (MBDF)	REMARKS
02.10.84	36"	X-70/X-68	570.0	Vetco RL 4	168	Joints nos. 3, 6 and 7 from shoe: Grade X-68
14.10.84	20"	X-52	129.0	VETCO LS-RH LS-LH	1183	Float shoe and float collar used. Drill Quip mudline suspension system used. XO at 148 m BDF.
30.10.84	13-3/8"	C-95	72.0	BDS + 4 joints Buttress LH (Shoetrack)	2443	Loadring at MLS-hanger would not pass by weld at top 20" casing. Diameter of hanger reduced from 18.51" to 18.25" (max load 1.75 mill lbs).
06.12.84	9-5/8"	P-110	53.5	BDS + 3 joints Buttress LH (Shoetrack)	4122	Top of 9-5/8" hanger (not including running tool) at 104.68 m BDF.
23.12.84	7" liner	P-110	35.0	BDS + VAM X/O for shoe, catcher sub and landing collar PHB	4395	Top of polished bore receptacle 3976.75 m. Top hanger slips 3983.05 m.

A/S NORSKE SHELL

TABLE.I.2

G.18841/6

BIT RECORD SUMMARY WELL NO 1/3-5

RUN NO.	BIT NO.	BIT SIZE INCH	MFGR/TYPE	JET SIZE 1	2	3	4	DEPTH OUT	MTRS	HRS	WOB (1000 KG)	RPM	PUMP PRESS (BAR)	LPM	MUD WT	VIS	CODE T	B	G	REMARKS
1	1	26	SEC S3S	22	22	22	-	160	54	15	0-9	100-150	55	3800	1.04	100	2	2	1	Seabed at 106m.36"H/O used.
2	RR1	26	SEC S3S	22	22	22	-	169	9	2	6-9	110	80	3800	1.04	100	2	2	1	Extended hole trying to get cond. deeper.
3	2	14-3/4	HTC OSC 3A	22	22	22	-	177	8	0.5	0-5	110	110	3785	1.04	100				With 26" stab. to get right direct. on hole.
4	RR2	14-3/4	HTC OSC 3A	22	22	22	-	675	498	25	0-7	110	110	3785	1.10	43	4	6	1	Controlled ROP to +/-30 mph.
5	3	14-3/4	SEC S4	22	22	22	-	1195	520	33	6-15	90-110	142	3785	1.12	51	3	6	1	-
6	4 H/O	26	SEC	16	16	20	-	345	0	10	0-5	100	110	3785	1.11	42				14-3/4" bit under the H/O.
7	RR4	26	SEC S3S	22	22	22	-	1195	0	51.5	0-5	100	133	3785	1.12	46	3	3	1	Open hole to 26".
8	5	17½	SEC S3S	22	22	22	-	1410	215	17	20	100-125	234	3785	1.25	47	3	3	1/16	Drill 17½" hole.
9	6	17½	HTC OSC1GJ	20	20	20	-	1652	242	15.5	18	115	234	3640	1.49	65	2	3	I	-
10	7	17½	OSC1GJ	22	22	22	-	2186	534	35	5-25	120	234	3034	1.70	53	2	3	I	-
11	8	17½	OSC1GJ	24	24	24	16	2470	284	30	10-30	120	234	2858	1.70	53	4	5	I	Broken teeth
12	RR8	17½	OSC1GJ	-	-	-	16	2470	0	-	-	-	-	2858	1.70	60	4	5	I	Checktrip before csg BT.
13	9	12-1/4	X1G	24	24	24	-	2845	375	42	10-25	90-120	222	2580	1.70	50	4	3	I	Drill 12-1/4" hole.
14	10	12-1/4	JD4	24	24	24	-	3103	258	84	15-30	70-90	220	2440	1.70	53	6	SF	I	-
15	11	12-1/4	X1G	24	24	24	-	3267	164	50	15-30	70-100	220	2440	1.70	52	7	8	I	-
16	12	12-1/4	X1G	24	24	24	-	3356	89	32.5	20-35	75-100	234	2540	1.70	50	6	7	I	-
17	13	12-1/4	J33	24	24	24	-	3563	207	73	20-30	40-80	234	2580	1.70	48	4	4	1/32	-
18	14	12-1/4	Smith SDGH	14	14	14	10	3628	65	22.5	20-30	80-105	276	2424	1.70	45	6	4	3/16	-
19	15	12-1/4	Strata PD3T	7 x 12				4138	510	130.5	15-23	170-190	255	2500	1.80	50	43	2	5	-
20	16	12-1/4	HTC R8	22	22	22	-	4138	0	-	5-15	50-70	276	2558	1.80	55	2	3	I	Mill junk.
21	17	8½	Strata PD3T	5 x 15				4138	-	-	5-10	100	220	1615	1.80	55	-	-	-	Drill cement.
22	RR17	8½	PD3T	5 x 10				4329	191	55.5	10-17	145	241	1615	2.00	56	100	%		Drill 8½" hole.
23	18	8½	PD3T	3 x 12/	2 x 11			4395	66	18	7	130	207	1642	2.08	50	20	%		-
24	19	5-7/8	Strata pax	4 x 12				4401	6	1.5	5	85	248	720	2.08	57	100	%		Drill cmt + 6m 5-7/8" hole.
25	20	5-7/8	DGJ	3 x 16				4423	22	14	5	90	228	720	2.11	56	7	7	1	Junk.
26	21	5-7/8	PD3T Strata	4 x 16				4513	90	38	4-5	130	241	720	2.11	52	2	2	1	60 % worn. Re-run.
27	22	5-7/8	PD3T Strata	4 x 16				4549	36	23.5	1-8	130	241	720	2.11	51	1	6	0 2	14 out of 20 cutters broken.
28	23	5-7/8	Smith F3	3 x 16				4592	43	31	6-8	50-60	241	720	2.11	48	4	4	0	-
29	24	5-7/8	TD103 D.Boart	3 x 14/	1 x 10			4710	118	51	3-4	140	248	740	2.11	52			I	15 - 20 % worn.
30	RR24	5-7/8	TD103 D.Boart	3 x 14/	1 x 10			4805	95	33	3-4	140	241	741	2.11	48			I	30 % worn.
31	25	5-7/8	Shark corehead					4814	9	3	4	120	152	539	2.11					30 % worn. 100% recovery
32	RR24	5-7/8	TD103 D.Boart	3 x 14/	1 x 10			4850	36	6	7	140	248	741	2.11	69			I	30 % worn

A/S NORSKE SHELL

TABLE.I.3

DEVIATION DATA WELL NO. 1/3-5

(MAGNETIC DECLINATION 4.5° W. OF TRUE NORTH)

(DISTANCE FROM DRILL FLOOR (DF) TO MEAN SEA LEVEL (M.SL) = 36.3 M)

DEPTH AH (M.BDF)	ANGLE (DEGREE FROM VERT.)	DIRECTION (DEGREE TRUE)	DEPTH T.V. (M.BDF)	NORTHING (M.FROM LOCN)	EASTING (M.FROM LOCN)	DOG LEG (°/ 30 M)
0.0	0.0	0.00	0.00	0.00	0.00	0.00
106.0	0.0	0.00	106.00	0.00	0.00	0.00
120.0	0.9	292.45	120.00	0.04	- 0.10	1.93
200.0	1.3	306.27	199.98	0.82	- 1.41	0.18
300.0	0.5	317.22	299.97	1.81	- 2.63	0.24
400.0	0.1	272.17	399.97	2.13	- 3.01	0.13
500.0	0.3	8.13	499.97	2.40	- 3.06	0.10
600.0	0.4	216.08	499.97	2.91	- 3.26	0.10
700.0	0.1	204.03	699.97	3.21	- 3.58	0.09
800.0	0.2	83.95	799.97	3.27	- 3.48	0.09
900.0	0.2	346.77	899.97	3.46	- 3.34	0.09
1000.0	0.3	276.68	999.97	3.66	- 3.64	0.09
1100.0	0.3	139.63	1099.97	3.49	- 3.73	0.17
1200.0	0.1	60.58	1199.96	3.34	- 3.49	0.09
1300.0	0.7	233.35	1299.96	3.02	- 3.90	0.24
1400.0	1.5	215.48	1399.94	1.58	- 5.15	0.26
1500.0	1.4	234.43	1499.91	- 0.19	- 6.91	0.15
1600.0	1.2	222.27	1599.89	- 1.68	- 8.60	0.10
1700.0	0.9	230.22	1699.87	- 2.96	- 9.91	0.10
1800.0	0.9	207.17	1799.86	- 4.16	- 10.87	0.11
1900.0	0.7	235.12	1899.85	- 5.20	- 11.73	0.13
2000.0	1.0	270.55	1999.84	- 5.55	- 13.11	0.18
2100.0	0.5	283.98	2099.83	- 5.43	- 14.40	0.16
2200.0	0.5	316.42	2199.83	- 5.01	- 15.13	0.08
2300.0	0.7	67.83	2299.82	- 4.46	- 14.86	0.30
2400.0	0.4	330.87	2399.82	- 3.93	- 14.47	0.25
2500.0	0.4	20.28	2499.82	- 3.30	- 14.52	0.10
2600.0	0.6	20.72	2599.81	- 2.48	- 14.21	0.06
2700.0	1.3	358.15	2699.80	- 0.86	- 14.06	0.23
2800.0	0.9	344.10	2799.78	1.03	- 14.31	0.14
2900.0	1.2	329.07	2899.76	2.69	- 15.07	0.12
3000.0	1.2	20.00	2999.74	4.57	- 15.25	0.31
3100.0	1.3	20.95	3099.72	6.61	- 14.48	0.03
3200.0	1.0	39.77	3199.70	8.34	- 13.52	0.14
3300.0	1.4	49.72	3299.68	9.80	- 12.03	0.13
3400.0	1.0	50.68	3399.66	11.15	- 10.42	0.12
3500.0	1.3	45.62	3499.64	12.49	- 8.94	0.09
3600.0	0.6	83.70	3599.62	13.34	- 7.60	0.27
3700.0	0.6	47.77	3699.62	13.75	- 6.70	0.11
3800.0	0.5	26.83	3799.61	14.49	- 6.11	0.07
3900.0	0.8	54.92	3899.61	15.28	- 5.34	0.13
4000.0	1.1	62.27	3999.59	16.13	- 3.92	0.10
4060.0	0.8	80.88	4059.58	16.47	- 3.00	0.21
4124.0 *	0.75	50.00	4123.56	16.82	- 2.24	0.19
4233.0 *	1.0	40.00	4232.56	18.01	- 1.08	0.11
4320.0 *	1.0	50.00	4319.55	19.08	- 0.01	0.06

Survey points from Eastman Whipstock's Gyroscopic Multishot, note that the points below 4060 m are from magnet single shots (*).

G.1884/5

CEMENTATION DATA WELL NO 1/3-5

JOB DATE	JOB DESCRIPTION	HOLE SIZE/ DEPTH (M. BDF)	CASING SHOE (M.BDF)	CEMENT TYPE	SACKS USED	SLURRY WEIGHT (PPG)	MIXWATER	ADDITIVES	LOSSES (BBLS)	REMARKS
14.10. 1984	20" Casing	26"/1195	1183	Class G	4010 545	13.2 15.8	910 bbls Freshwater 66 bbls Freshwater	0.4 gps econolite	-	Because the total cement required for the lead slurry was close to the maximum available, the actual volume was reduced by 40 bbls to ensure sufficient cement remained for tail. Temperature log showed cement to seabed.
30.10. 1984	13-3/8" csg.	17½"/2470	2443	Class G	3900 660	14.5 15.8	621 bbls Freshwater 77 bbls Freshwater	0.15 gps econolite 0.16 gps HR-6L 0.22 gps CFR-2L 0.03 gps HR-6L	-	All cement onboard was used. To be sure to have enough cement for tail slurry we switched to tailslurry when approx. 30 tons left (theoretically 23.5 tons).
06.12. 1984	9-5/8" csg	12-1/4"/ 4138	4122	Class G + class G with 35% silica-flour	2172 309	15.2 15.8	286 bbls Freshwater + 2.25 lbs/bbl bentonite 43 bbls Freshwater	0.22 gps CFR-2L 0.18 gps HR-12L 0.29 gps CRF-2L 0.18 gps HR-12L 1 % BWOC Halad-22A 35 % BWOC SSA-1	-	The top plug was not bumped. After reached 95 % pump efficiency, it was decided to stop displ. the cement.
23.12. 1984	7" liner	8½"/4395	4395	Class G + 35 % silica-sand	198	17.6	20.5 bbls Freshwater	0.36 gps CFR-2L 0.24 gps HR-12L 0.75 % BWOC Halad-22A 35 % BWOC SSA-2 13.83 % BWOC High dense No.3	-	20 bbls spacer ahead, 5 bbls behind composed of: 25.93 gal/bbl freshwater 0.77 gal/bbl HR-12L 22.5 lb/bbl "dual spacer" 488 lb/bbl barite. Problems were experienced maintaining required wt. Cement was mixed and pumped in 8 batches.
20.01. 1985	Abandonment plug no.1	5-7/8"/ 4695-4845	4395	Class G	117	18.3	14.8 bbls Freshwater	35 % SSA-2 30.6 lb/sx hi-dense 0.29 gps CRF-2L 0.39 gps HR-12L	-	Displaced to hydrostatic. While pulling back to 4645 m 70 ton overpull occured 3 stands 1 single out (95 m), tubing parted. Circ string clean POOH. Theoretical top cement 4692.5 with stinger fish in. Top stinger fish 4554 m.

A/S NORSKE SHELL

TABLE 1.5a

JOB DATE	JOB DESCRIPTION	HOLE SIZE/ DEPTH (M. BDF)	CASING SHOE (M.BDF)	CEMENT TYPE	SACKS USED	SLURRY WEIGHT (PPG)	MIXWATER	ADDITIVES	LOSSES (BBLS)	REMARKS
21.01. 1985	Abandonment plug no.2	5-7/8"/ 4490 - 4640	4395	Class G	184	18.3	23.1 bbl Freshwater	35 % SSA-2 30.6 lb/sx hidense 0.29 gps CRF-2L 0.39 gps HR-12L	-	Displaced with 96.7 bbls. No backflow. 10 tons overpull 1st stand. After pulling back to 4432 m 1000 psi required to circ normal way. No cement to surface.
21.01. 1985	Abandonment plug no.3	5-7/8" - 6"/ 4275- 4432	4395	Class G	88.7	18.3	11.2 bbls Freshwater	35 % SSA-2 30.6 lb/sx hidense 0.29 gps CFR-2L 0.39 gps HR-12L	-	Displaced with 92.3 bbls. No backflow. Pull back to 4228 m, 5 tons overpull on first two stands. 1500 psi required to break circ.
23.01. 1985	Abandonment plug no.4	6" - 8.515"/ 3900- 4025	-	Class G	110	18.3	13.8 bbls Freshwater	35 % SSA-2 30.6 lbs/sx hidense 0.29 GPS CFR-2L 0.23 GPS HR-12L	-	Displaced with 82.5 bbls mud. No backflow. Pulled back to 3809 m 1200 psi required to break circ.
29.01. 1985	Abandonment plug no.5	8.515" 2337- 2391	-	Class G	237	16.2	26.2 bbls Freshwater	0.08 GPS HR-6L	4.2 bbls	Displaced with 125 bbls mud. No backflow. Pulled back to 2133 m. Circ. clean. Pulled one more stand. Squeezed 4.2 bbls into the formation. Casing window 2345 - 2348.5 m. Theoretical top of cement: 2210 m. Soft cement down to 2337 m. Below this depth hard cement.
31.01. 1985	Abandonment plug no.6	8.515"/ 2105- 2334	-	Class G	225	15.8	27.3 bbls Freshwater	0.1 gps CFR-2L	-	Displaced with 121.5 bbls mud. No backflow. Pulled back to 2075 m. Circ. BU. No cement returns. Pulled one more stand. Squeezed away 1/4 bbl with 2000 psi. Cement tagged with 7 tons at 2105 m. Tested with 2000 psi. OK.
03.02. 1985	Abandonment plug no.7	8.515"/ 12.346"/ 875- 1145	-	Class G	289	15.8	35.7 bbls Freshwater	-	-	Displaced with 50 bbls mud. No backflow. Pulled back to 846 m. No overpull. Circ. BU, no cement returns. Cement tagged at 875 m. Tested with 8 tons and 2000 psi, Ok.
04.02. 1985	Abandonment plug no.8	12.346"/ 121.5- 350	-	Class G	513	15.8	64.9 bbls Seawater + 2% BWOC $CaCl_2$	-	-	Displaced with 6.5 bbls mud. No backflow. Pulled back to 116 m. No overpull. Circ BU, no cement returns. Circulated well to seawater.

G.1884/10

TIME ALLOCATION 1/3-5

Started well at 05.00 hrs 01.10.84
Spudded well at 09.00 hrs 01.10.84
Abandoned well at 14.00 hrs 10.02.85

PHASE	ITEM	OCT	NOV	DEC	JAN	FEB	TOTAL HRS	%
DRILLING	- Bit on bottom	234.5	434.5	89.0	182.5		940.5	29.6
	- Round tripping	142.5	121.0	215.0	79.0		557.5	17.5
	- Reaming/ enlarging	10.5	9.5		2.0		22.0	0.7
	- Circulation/ condition mud	61.0	44.0	100.0	38.5		243.5	7.7
	- Condition hole for casing	10.0		23.0			33.0	1.0
	- Running casing/drilling cement	98.0	4.0	55.5			157.5	5.0
	- Leak off test	4.5	3.0	11.0			18.5	0.6
	- Cementing & WOC	24.5		22.5			47.0	1.5
	- Running/ pulling diverter/BOP	43.5					43.5	1.4
	- Flanging up and testing	43.5	49.0	67.0	35.0		194.5	6.1
	- Fishing		29.5	37.5			67.0	2.1
	- Repairs	11.0	1.0	1.0	2.5		15.5	0.5
	- Surveys	11.0	6.0	9.5	3.5		30.0	0.9
	- Other	17.0		24.0	3.5		44.5	1.4
	Sub total						2414.5	76.0
EVALUATION	- Coring (on bottom)				3.0		3.0	0.1
	- Round trip with core barrel				14.5		14.5	0.5
	- Condition hole for coring				8.0		8.0	0.2
	- Recovery of core				0.5		0.5	0.0
	- Condition hole for logging	8.5			3.5		12.0	0.4
	- Logging	19.0	18.5	89.0	61.5		188.0	5.9
	- RFT testing				24.5		24.5	0.8
	- Other				0.5		0.5	0.0
	Sub total						251.0	7.9
ABANDONMENT	- Plugging back and WOC				259.0	67.0	326.0	10.2
	- Cutting/ retrieving casing				6.5	72.0	78.5	2.5
	- Rigging up/down BOP stack					22.5	22.5	0.7
	- Laying down string				16.0	9.5	25.5	0.8
	- Repairs					3.0	3.0	0.1
	- Preparing for move					53.0	53.0	1.7
	- Waiting on weather					3.0	3.0	0.1
	Sub total						511.5	16.1
					TOTAL HOURS		3177.0	100 %
					Total time:		132 days 9 hours	

A/S NORSKE SHELL

TABLE.I.6

I.2 MUD REPORT

See special report from Dresser Magcobar (submitted to NPD on 12.07.85).

I.4 SITE SURVEY

A/S Norske Shell commissioned A/S Geoteam to conduct a site survey at location 1/3-D.

The coordinates of the planned well were:

56^{o} 46' 16.68"N
02^{o} 53' 38.76"E

This survey supplemented a survey carried out previously in September 1981.

The survey was designed to map seabed and sub-seabed features in the area, and especially to detect any features that could be a hindrance or hazard to the planned drilling operation which was to take place from a jack-up rig.

The survey was divided into two separate parts. Part one was an analog survey using echo-sounder, side scan sonar, deep-towed sparker, and analog surface-towed sparker. This equipment was used to collect data on seabed features and shallow geology. Part two of the survey was carried out as a high resolution seismic survey using an airgun as energy source, with multichannel digital recording. The processed seismic sections from this part of the survey were used to detect possible shallow gas pockets, and to give information about the general geology.

From the processed digital sparker lines some strong reflectors at about 240 m.secs (195 m) can be observed. These anomalies, which are some 100m away from the original location, could be caused by lithological contrasts, or by some of the sand layers being gas charged.

Although no anomalous reflector could be observed at the planned drilling location, it was decided to move the 1/3-D location an extra 50m to the southwest - away from the observed anomaly - taking into account the (in)accuracy of the navigation system, Pulse 8, which was used during the recording of the digital sparker lines.

Proposed new location 1/3-D:

56° 46' 15.3" N
02° 53' 37.3" E

I.5 GEOLOGICAL SAMPLES

Ditch Cuttings

Cutting samples were collected every 10 m from 168 m to 2470 m. In the interval 2470 m to 4850 m (TD) samples were taken every 3 m.

The cuttings were taken and described by the geologists of the mudlogging contractor Exlog under supervision of Shell wellsite geologists (Cato Berge, Wilfred Pool).

For a detailed description of the cutting samples see the Exlog Formation Evaluation Log and the Shell geologists' Cuttings Log (Appendix).

Cores

One core was cut in the objective Rotliegendes Group sandstones

core no. 1: 4805 m - 4814 m, recovery: 100%

For details, see core description sheets (Encl. 4), Formation Evaluation and Cuttings Logs (Appendix), and core photos (Appendix). For a listing of core analysis results see GECO's report (Appendix).

Sidewall cores

Sidewall cores were shot in the 8 1/2" and 5 7/8" hole sections. A total of 97 samples were attempted, 65 of which were recovered.

I.6 HYDROCARBON INDICATIONS

The following is a brief description of hydrocarbon indications as encountered while drilling. The shows are also indicated on the Completion log (Encl. 1) and described in detail on the Cuttings log (Appendix) and Formation Evaluation log (Appendix) respectively. Depths of the shows are generally given in driller's depth. On the completion log (logger's depth) minor shifts may be observed.

1) Tertiary (SF-3288 m)

In the Tertiary sequences, significant hydrocarbon indications are virtually absent. Apart from a low background of C_1, occasional traces of C_2 - C_4 were encountered.

2) Chalk Group (3288 m-4580 m)

While drilling the Ekofisk and Tor Formations, gas readings of C_1 (traces - 0.1%), with an occasional trace of C_2 - C_3, were recorded.

Traces of yellow direct fluorescence, mainly on fractures, with a moderate milky-white cut fluorescence were observed at the top of the Tor Formation and at several levels deeper down in the formation.

When drilling the Hod Formation, ditch gas readings increased from traces to a background of 0.2 - 0.6% C_1.
C_2 - C_4 were also frequently recorded (maxima of respectively 0.3%, 0.06%, 0.01%). Many gas peaks were observed, locally even up to ca. 5%, often coinciding with somewhat more sandy intervals in the formation. These higher gas readings may have been caused, at least partly, by the rise in pore pressure. Near the base of the Hod Formation, a very weak and slow pale yellowish cut fluorescence was occasionally observed. Direct fluorescence was not detected.

Gas readings of C_1 were recorded from 0.03-0.3% in the Herring, Plenus Marl, and Hidra Formations.

3) Cromer Knoll Group (4580 m-4734 m)

In this interval C_1 gas readings of 0.1 - 0.4% were recorded. C_2 and C_3 readings were observed up to 0.01 and 0.003% respectively.

4) Zechstein Group? (4734 m-4769 m)

C_1 readings in this interval ranged from 0.05 - 0.14%, and C_2 readings had a maximum of 0.002%. An occasional trace of C_3 was encountered.

5) Rotliegendes Group? (4769 m-TD)

The C_1 readings decreased even more in the Rotliegendes sandstones (0.04 - 0.10%), and traces of C_2 were only present near the top.

1.7 PETROPHYSICAL REPORT

Weak shows were observed in the drill cuttings in the Maastrichtian Limestone over the interval 3380 - 3415 m, with sporadic faint shows down to 3800 m. A petrophysical evaluation over the limestone confirmed the interval to be water-bearing. The following petrophysical parameters were assumed: formation water resistivity Rw = 0.020 ohmm, cementation factor m = 2.00.

An evaluation over the interval 4369 - 4388 m indicated the zone to be marginally hydrocarbon-bearing, with a hydrocarbon saturation of 35%. This is supported by the connection gas and flow-check gas observed while drilling through this section. The interval has two thin sand stringers with an average porosity of 12%. An FMT sample taken at 4387 m BDF recovered mud filtrate only. The following parameters were assumed: Rw = 0.018 ohmm, m = 2.00.

A small sand stringer at 4444 - 4448 m is observed to have a hydrocarbon saturation of 44%, and an average porosity of 16%, based on an assumed Rw = 0.009 ohmm, m = 2.00.

The objective Rotliegendes Sandstone was encountered at 4768 m and is considered to be water-bearing. This is supported by low background gas readings and lack of shows while drilling through the interval. An FMT sample taken at the top of the formation at 4770 m recovered mud filtrate, with no indications of hydrocarbons.

The calculated hydrocarbon saturation profile S_h, assuming a salt saturated formation water, increases to 35% S_h towards the top of the Rotliegendes Sandstone (see enclosure). This phenomenon is not considered significant, and the formation is believed to be 100% water bearing, as confirmed by the FMT sample. The trend of the saturation curve is observed to closely parallel the density log. The water resistivity was calculated to be 0.005 ohmm.

Special core analysis performed on five plugs from the cored interval 4805 - 4815 m suggested the following formation resistivity factor (FRF) versus porosity relationship:

$$FRF = 0.48 \times \emptyset^{-2.48}_{\text{in-situ}}$$

where $\emptyset_{\text{in-situ}}$ is the stressed porosity at confining pressure of 2000 psi.

The high slope of this line (see Fig. I.7.1), with a cementation factor of m = 2.48 is considered realistic for sandstones buried at this depth.

The effect of confining pressure on porosity for the five core plugs was investigated, and the following relationship determined:

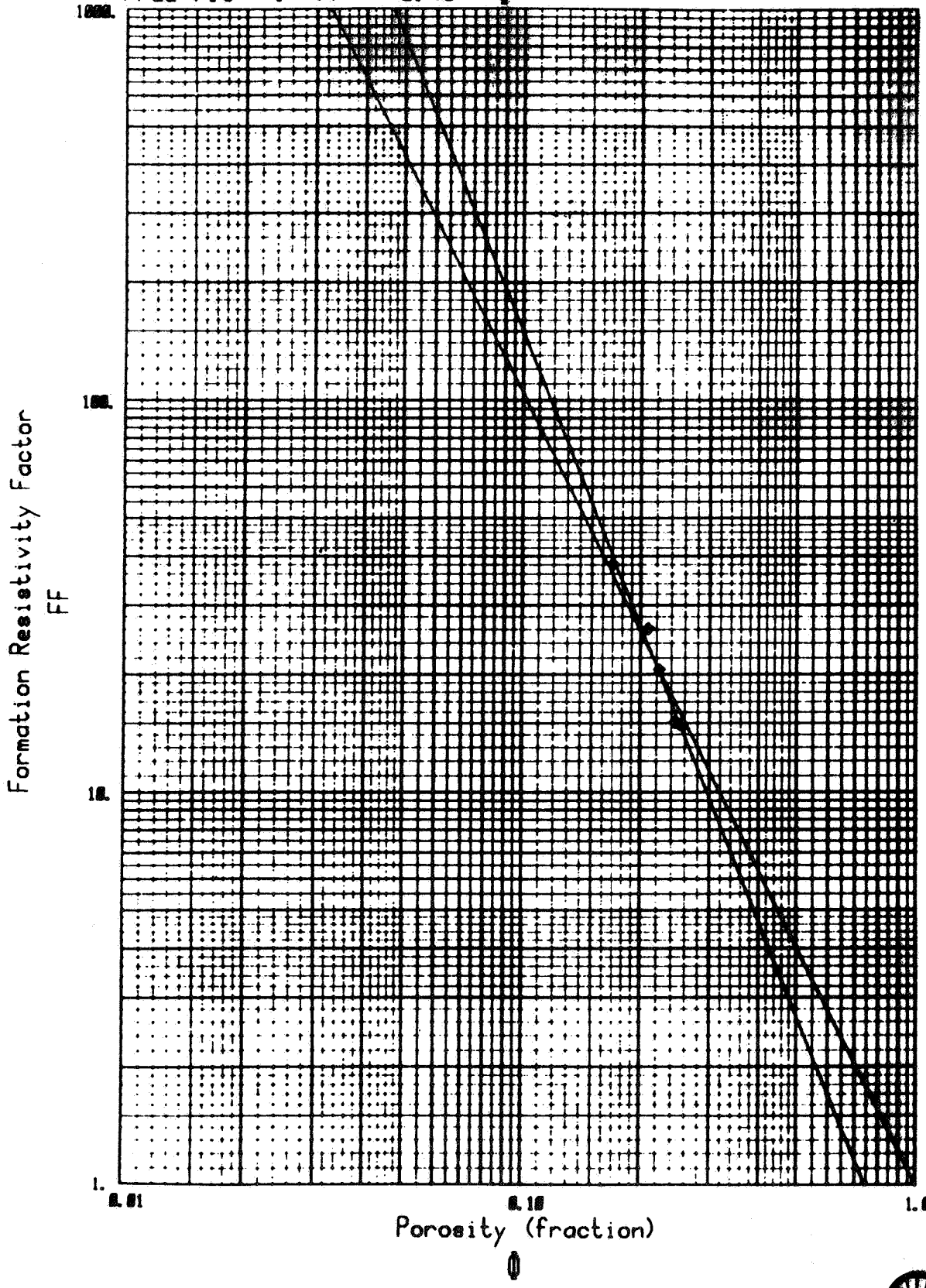
$$\emptyset_{\text{in-situ}} = 0.95 \times \emptyset_{\text{surface}}$$

where $\emptyset_{\text{in-situ}}$ is the porosity at reservoir conditions.
$\emptyset_{\text{surface}}$ is the laboratory measured porosity.

The porosities measured from core plugs when corrected for compaction, are observed to agree well with the calculated porosities from log response (see enclosure 6).

FORMATION RESISTIVITY FACTOR VERSUS POROSITY

Well : 1/3-5
Confining pressure : 2000 psi
Forced fit : $FF = 1.00 * \phi^{-2.81}$
Free fit : $FF = 0.48 * \phi^{-2.48}$



A/S NORSKE SHELL

I.8 WIRELINE FORMATION TESTS

Formation Multi Testers (FMT) were run in the 12 1/4" and 8 1/2" hole. Out of 108 pressure test attempts, 45 had a seal failure, 26 were tight, 7 were plugged and only 30 recorded a build-up formation pressure. Pressures on all runs were recorded with the Dresser Atlas strain gauge.

Mud hydrostatic pressures in the 12 1/4" hole survey, before and after the pressure tests, exhibited differences of less than 10 psi in general, but occasionally as high as 28 psi (point 29, Table I.8.1). A systematic drift in pressure of some 17 psi can be observed between points 11 and 34, 14 and 35, 19 and 41 and 25 and 40 (Table I.8.1). These points are tabulated in order of measurement. The observed formation pressures suffered from "supercharging" as a result of the combination of high mud overbalance (of some 1200 psi) and a very tight formation. Calculated permeabilities were lower than 1 mD (Table I.8.1).

Mud hydrostatic pressures in the 8 1/2" hole survey, before and after the pressure tests, agreed well; the maximum difference observed was 5 psi (point 30, Table I.8.2). Although somewhat different mud pressures were measured at different times at similar depths, no systematic drift was detected. The formation tested was extremely tight. Only on 6, out of 38 pressure tests, a build up pressure was recorded. In all 6 cases these pressures approached the mud hydrostatic pressure indicating "supercharging". The observed mud hydrostatic gradient was 0.87 psi/ft (Fig I.8.2). An unsuccessful sampling attempt was made at 4387 m bdf.

Mud hydrostatic pressures in the 5 7/8" hole survey, before and after the pressure tests, showed differences up to 21 psi (points A8 and C7, Table I.8.3). Because this survey involved three separate runs no attempts were made to detect systematic pressure drifts. Mud hydrostatic pressures from runs A and B supported a mud hydrostatic gradient of 0.8 psi/ft. Formation pressures measured did not support any trend (Fig. I.8.3). Permeabilities calculated from the tests range from 1.5 to 14 mD (Table I.8.3). A one, and a 2 3/4, US gallons sample were collected at 4770 m bdf. Both samples consisted of mud filtrate and/or water (Table I.8.4).

Conclusions

No clear formation fluid gradients have been established in any of the surveys. The formations tested in the 12 1/4" and 8 1/2" holes were extremely tight. Permeabilities calculated from the 5 7/8" hole survey ranged from 1.5 to 14 mD. "Supercharging" was observed in all three surveys. The fluid samples collected during the 5 7/8" hole survey consisted of mud filtrate and formation water.

The FMT tool performed satisfactorily, taking into account the extremely high pressures (14500 psig) and temperatures (337^{o}F) encountered.

TABLE I.8.1

WELL 1/3-5

FMT - PRESSURE DATA

FMT Run : 03.12.1984
Bit Size : 12 1/4"
DFE : 36.3 m (vertical well)
Strain Gauge: 68700_3
Pre-test : 10 cm^3 chamber

NO	Depth m bdf	Uncor. Mud Press (psig) Before	After	Corr. Form. Press. (psig)	Remarks
1	3387.0	8695	8694	-	Tight
2	3387.5	8697	8690	8038	0.2 mD
3	3398.0	8742	8766	-	Tight
4	3397.5	8737	8736	-	Tight
5	3398.5	8740	8737	7768	0.2 mD
6	3407.0	8763	8762	-	Tight
7	3407.5	8765	8763	7776	0.2 mD
8	3411.0	8774	8772	7751	0.15 mD
9	3416.5	8791	8788	7718	0.2 mD
10	3398.5	8736	8738	7770	0.1 mD
11	3422.0	8808	8808	7651	0.2 mD
12	3430.5	8834	8832	-	Tight
13	3431.5	8835	8833	7759	0.5 mD
14	3438.5	8854	8852	7667	0.2 mD
15	3455.0	-	-	-	Tight
16	3455.5	8903	8899	7750	0.1 mD
17	3465.0	8927	8925	7824	0.3 mD
18	3465.5	8928	8925	7821	0.2 mD
19	3473.0	8951	8950	7703	0.5 mD
20	3473.0	8950	8947	-	Plugging
21	3490.5	-	-	-	No seal
22	3490.5	8996	8994	-	Plugging
23	3497.5	9014	9011	7785	0.3 m
24	3540.0	-	-	-	No seal
25	3540.0	9131	9127	7808	0.2 mD
26	3577.5	-	-	-	No seal
27	3577.5	-	-	-	No seal
28	3578.0	9233	9213	8045	0.3 mD
29	3611.0	9310	9282	8112	0.4 mD
30	3677.0	9481	9476	8221	0.4 mD
31	3407.5	-	-	-	No seal
32	3407.5	8801	8793	7808	0.5 mD

TABLE I.8.1
continued

NO	Depth m bdf	Uncor. Mud Press (psig) Before	After	Corr. Form. Press. (psig)	Remarks
33	3422.0	-	-	-	No seal
34	3422.1	8834	8826	7668	0.6 mD
35	3438.5	8875	8868	7687	0.8 mD
36	3473.0	-	-	-	No seal
37	3473.1	-	-	-	No seal
38	3473.0	-	-	-	No seal
39	3540.0	-	-	-	No seal
40	3540.1	9151	9141	7825	0.3 mD
41	3472.9	8946	8949	7721	0.3 mD
42	3165.0	8171	8169	7293	0.7 mD

TABLE I.8.2

WELL 1/3-5

FMT - PRESSURE DATA

FMT Run : 20.12.1984
Bit Size : 8 1/2"
DFE : 36.3 m (vertical well)
Strain Gauge: 68701_3
Pre-test : 10 cm^3 chamber

NO	Depth m bdf	Uncor. Mud Press (psig) Before	After	Corr. Form. Press. (psig)	Remarks
1	4288.5	12448	12444	-	Tight
2	4289.0	12452	12452	-	Tight
3	4308.0	12500	12504	12357	Still Rising
4	4307.5	-	-	-	No seal
5	4307.5	12501	12501	12451	Still Rising
6	4370.5	12673	12673	-	Tight
7	4371.0	12676	12681	-	Tight
8	4373.0	12684	12686	12439	Still Rising
9	4372.5	12683	-	-	No seal
10	4372.5	-	-	-	No seal
11	4372.5	-	-	-	No seal
12	4372.7	12681	12682	-	Tight
13	4376.0	12696	12696	-	Tight
14	4378.0	12699	12698	-	Tight
15	4382.5	12713	12713	12680	Still Rising
16	4384.0	12719	-	-	No seal
17	4384.0	-	-	-	No seal
18	4384.3	-	-	-	No seal
19	4386.0	12725	-	-	No seal
20	4386.0	-	-	-	No seal
21	4386.5	12726	-	-	No seal
22	4387.0	12731	-	-	No seal
23	4387.0	12733	12734	12729	Supercharged
24	4389.0	-	-	-	No seal
25	4389.0	12736	12736	-	Tight
26	4389.0	12736	-	-	No seal
27	4389.5	12736	12736	-	Tight
28	4391.0	12739	12740	-	Tight
29	4373.0	-	-	-	No seal
30	4373.0	12689	12684	-	Tight
31	4373.2	12682	-	-	Tight
32	4377.8	-	-	-	No seal
33	4372.8	-	-	-	No seal
34	4372.9	12683	12680	-	Tight
35	4372.5	12680	-	-	No seal
36	4373.0	12681	-	-	No seal
37	4373.0	12682	12680	-	Tight
38	4387.0	12720	12718	12718	Supercharged

Attempted to sample during no.38

NSEP 246/044/hs

TABLE I.8.3

WELL 1/3-5

FMT - PRESSURE DATA

FMT Run : 19.01.1985
Bit Size : 5 7/8"
DFE : 36.3 m (vertical well)
Strain Gauge: 68701$_3$(A,C) & 66571 (B)
Pre-test : 10 cm^3 chamber

NO	Depth m bdf	Uncor. Mud Press (psig) Before	After	Corr. Form. Press. (psig)	Remarks
A1	4426.0	13145	13148	-	No seal
A2	4425.0	13127	13127	-	No seal
A3	4452.0	13243	13234	-	No seal
A4	4453.0	13232	13230	-	No seal
A5	4515.0	13437	13431	-	No seal
A6	4515.5	13424	13420	-	No seal
A7	4520.0	13435	13433	-	No seal
A8	4529.0	13471	13450	13299	Tight
A9	4762.5	14130	14117	13786	Tight
A10	4770.0	14147	-	-	No seal
A11	4770.0	14139	-	-	No seal
B1	4770.0	14133	14138	-	No seal
B2	4769.5	14131	-	-	No seal
B3	4774.5	14165	-	-	No seal
B4	4774.5	14143	-	-	No seal
B5	4775.0	14155	-	-	No seal
B6	4774.8	14144	-	-	No seal
B7	4762.5	14095	-	-	No seal
C1	4770.0	14226	14208	13885	14 mD
C2	4774.5	14227	14217	13892	1.5 mD
C3	4769.5	14199	14203	-	Still Rising
C4	4769.8	14217	14205	13892	4.9 mD
C5	4770.0	14136	14104	13794	4.5 mD
C6	4807.0	14128	14239	-	Plugged
C7	4836.0	14255	14234	13866	Plugging
C8	4807.0	-	-	-	Plugged
C9	4806.5	14214	-	-	Plugged
C10	4806.5	14213	14206	13870	Plugging

Collected samples during C5 - 2 3/4 U.S. gallons CIP 13758 psig (corr.)
- 1 U.S. gallon CIP 13757 psig (corr.)

TABLE I.8.4

WELL 1/3-5

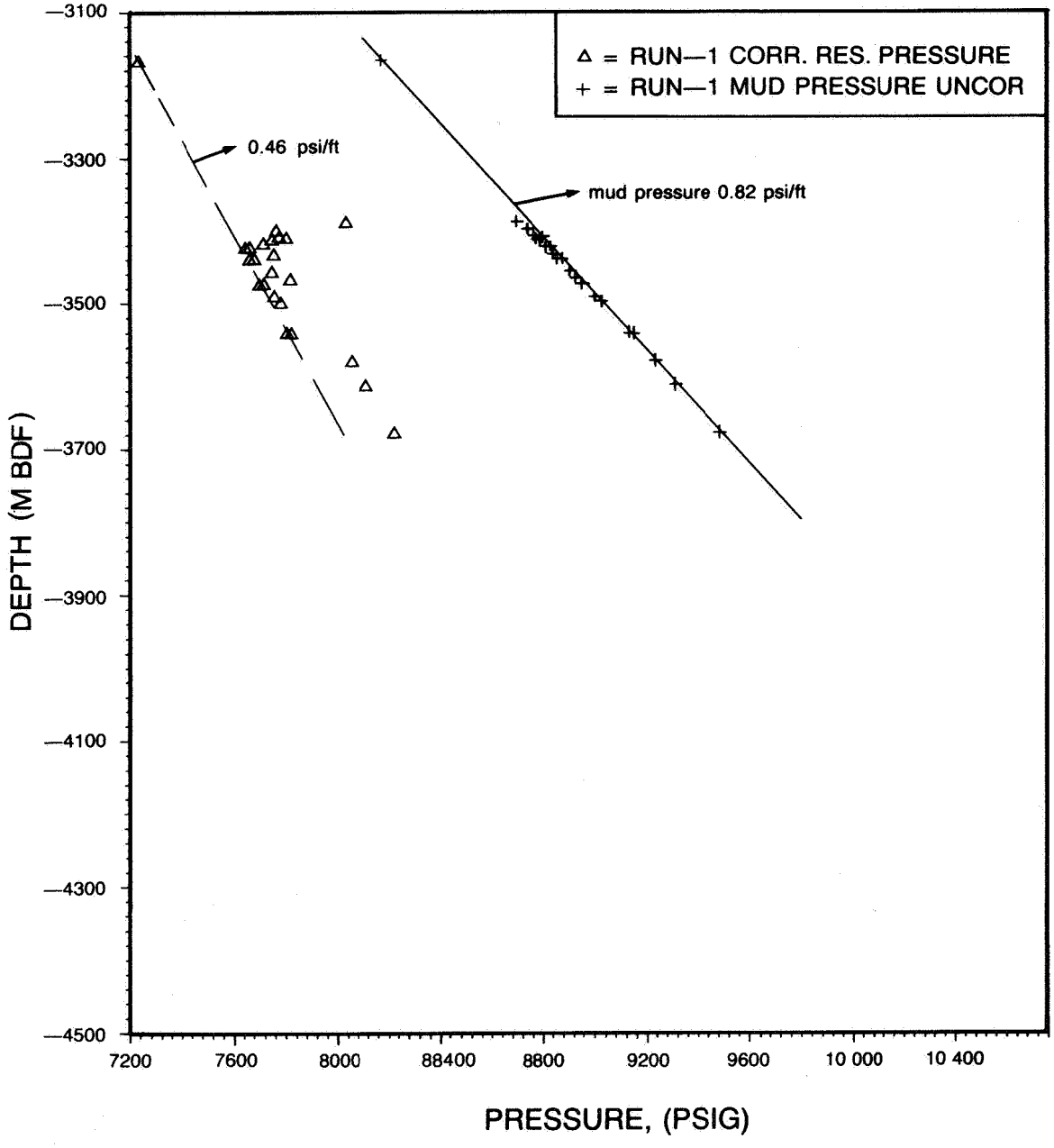
FMT SAMPLE DATA

FMT Run : 19.01.1985
Bit Size : 5 7/8"
DFE : 36.3 m (vertical well)
Strain Gauge: 68701
Depth : 4770 m bdf.

On-Site Recovery and Analyses

Chamber Size (U.S. gallons)	2.75	1.00
Gas Pressure (psig)	0	0
Gas Volume (liters)	0	0
Fluid Volume (liters)	8.6	3.0
Density	1.05	1.07
Chlorides (ppm)	36000	50000
pH	6.8	6.5
Hardness Ca/Mg	880/73	1680/195

Both samples were dark brown in colour. Pale yellow/green overall fluorescence was observed, which compared with a dull green fluorescence in normal mud filtrate. The samples were considered to be filtrate and formation water.

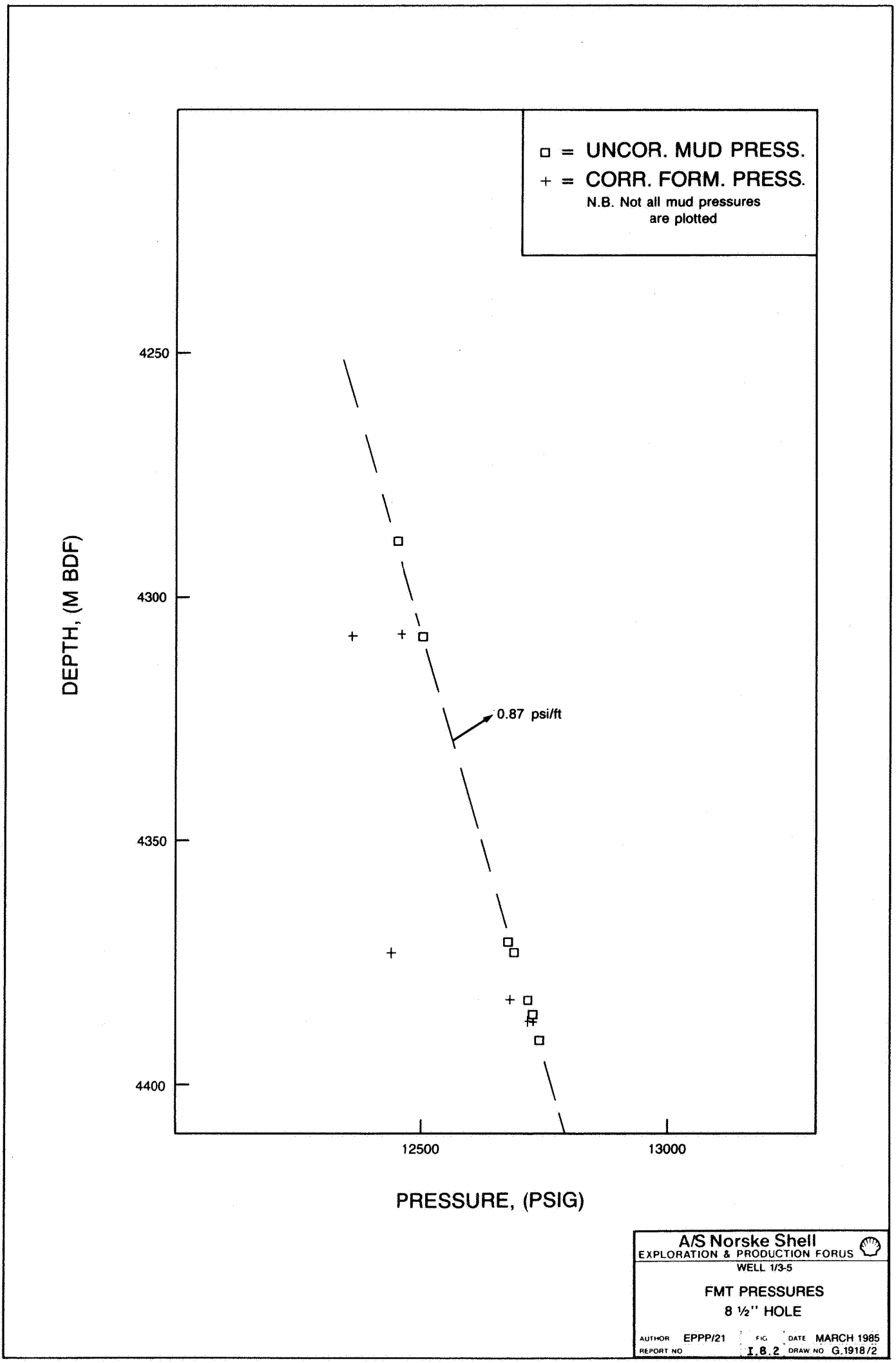


A/S Norske Shell
EXPLORATION & PRODUCTION FORUS

WELL 1/3-5

FMT PRESSURES
12¼" HOLE

AUTHOR EPPP/21 | FIG I.8.1 | DATE MARCH 1985
REPORT NO | DRAW NO G 1918/1

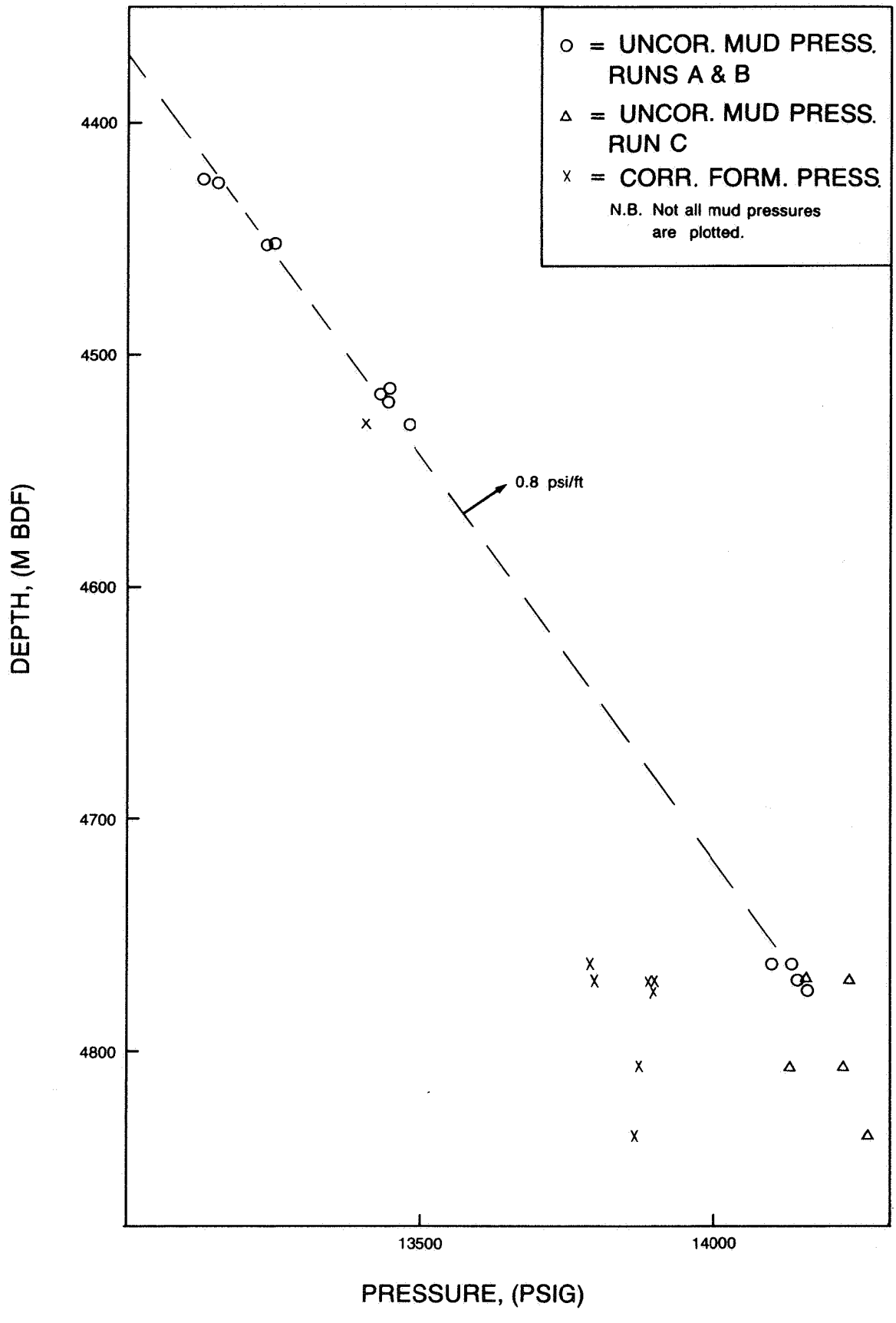


A/S Norske Shell
EXPLORATION & PRODUCTION FORUS

WELL 1/3-5

FMT PRESSURES
8 ½" HOLE

AUTHOR EPPP/21 FIG. I.8.2 DATE MARCH 1985
REPORT NO DRAW NO G.1918/2



A/S Norske Shell
EXPLORATION & PRODUCTION FORUS

WELL 1/3-5

FMT PRESSURES
5 7/8" HOLE

AUTHOR	EPPP/21	FIG	I.8.3
REPORT NO		DATE	MARCH 1985
		DRAW NO	G.1918/3

II.1 INTRODUCTION

Well 1/3-5 is located in the southeastern part of block 1/3 on seismic line 79111 (SP 527).

Final coordinates were: N 56° 46' 16.02"
E 02° 53' 38.85"

The objective of the well was to test the Rotliegendes Sandstones (Late Permian), contained in a large tilted fault block which lies mainly in A/S Norske Shell's Block 1/3 and 1/6 and extends into Blocks 2/1 and 2/4.

The well encountered weak oil shows in the upper part of the Tor Formation (Maastrichtian) and weak gas shows mainly in the sandy intervals of the Hod Formation.

The Rotliegendes Sandstones were found to be water-bearing.

No production test were carried out.

II.2 STRATIGRAPHY

Mainly on log correlation, the sedimentary sequence penetrated by well 1/3-5 has been subdivided into lithostratigraphic groups and formations as defined by the regional geology of the area.

The following is a brief lithological description of the different formations:

Table II.2.1 gives the formation tops, while table II.2.2 shows the biostratigraphic subdivision as established by SIPM (for the Tertiary and Cretaceous) and by A/S Norske Shell's stratigraphic laboratory (for the Jurassic and Permian). This information is also shown on the completion log and the well summary sheet (enclosures 1 and 2).

a) Nordland/Hordaland Group 106.3 (SF) - 3062 m

From the seafloor (106.3 m) to 168 m the hole was drilled with returns to seabed.

From 168 m to ca. 535 m: soft, often calcareous, grey clays interbedded with fine to medium grained sands.

From 535 to ca. 1200 m: mainly grey clays with occasional sand beds.

From ca. 1200 m to 3042 m: clays, occasionally silty and calcareous, grey, brown-grey and olive-grey. The clay is firmer and grades into claystone. Streaks of dolomitic limestone and dolomite.

From 3042 to 3062 m: red-brown and, in places, greenish grey claystone.

b) Rogaland Group 3062 - 3288 m

Balder Formation 3062 - 3070 m

Bluish grey mottled, locally calcareous, tuff.

Sele Formation 3070 - 3078 m

Mainly grey - green-grey claystone.

Lista Formation 3078 - 3153 m

Grey - olive-grey - brown-grey, silty, locally calcareous claystones intercalated with light grey, silty, argillaceous, and occasionally calcite-cemented very fine to fine grained sandstones.

Maureen Formation 3153 - 3288 m

Top: (ca. 50 m) off-white chalky limestone with traces of chert.

Middle: mainly dark grey claystone/shale (ca. 10 m) followed by red-brown silty claystone (locally green-grey), grading into calcareous grey claystone. Several limestone interbeds.

Bottom: (ca. 30 m) mainly chalky limestone and light grey marl.

c) Chalk Group 3288 - 4580 m

Ekofisk Formation 3288 - 3384 m

Off-white - very pale brown chalky limestone, locally silicified and with traces of chert.

Tor Formation 3384 - 3858 m

Limestones very similar to the Ekofisk Formation. The top of the Tor Formation can be picked on a lower gamma ray and faster sonic. Locally traces of dark grey claystone/shale.

Hod Formation 3858 - 4524 m

Increasingly argillaceous buff-light grey, locally green-grey - pink, limestone occasionally grading to marl.

Towards the bottom: predominantly buff - off-white and locally clean limestone. From ca. 4370 m downward: limestone, often sandy/silty. Occasional very fine grained sandstone streaks.

Herring Formation 4524 - 4563 m

The top: porous, coarse crystalline dolomite.

Below that: white - light grey limestone locally grading into calcareous sandstone.

Plenus Marl 4563 - 4568 m

Dark grey - black claystone with a varying calcareous content.

Hidra Formation 4568 - 4580 m

Limestone, white - light grey, locally very sandy and/or argillaceous.

d) Cromer Knoll Group 4580 - 4689 m

Rødby Formation 4580 - 4604 m

Pale pinkish - light grey, soft limestone locally grading to marl.

Sola Formation 4604 - 4625 m

Light grey - buff limestone, locally very argillaceous. Dark grey - red-brown - pale green calcareous claystone intercalations.

Valhall Formation 4625 - 4689 m

Dark grey to pale green-grey, silty claystones. Pale greenish grey, very fine grained, sandstone intercalations. Frequent light brownish grey, sandy limestone beds.

e) New Red?/Cromer Knoll Group? 4689 - 4734 m

Very similar lithology to the Valhall Formation. The claystone is more red-brown.

f) Zechstein Group 4734 - 4769 m

Red-brown silty claystones with interbeds of very fine grained sandstones and some anhydrite beds.

At the base: argillaceous, sandy, brown-grey dolomitic limestone.

g) Rotliegendes Group 4769 - 4850 m (TD)

Mainly fine to medium grained, well sorted sandstones. The top part: (ca. 25 m) off-white coloured. The bottom part: mainly reddish brown.

Well 1/3-5

Formation Tops (m BDF):

Nordland Group (Sea Floor)	106 m
Hordaland Group	1075 m?
Rogaland Group	3062 m
Balder Formation	3062 m
Sele Formation	3070 m
Lista Formation	3078 m
Maureen Formation	3153 m
Chalk Group	3288 m
Ekofisk Formation	3288 m
Tor Formation	3384 m
Hod Formation	3858 m
Herring Formation	4524 m
Plenus Marl Formation	4563 m
Hidra Formation	4568 m
Cromer Knoll Group	4580 m
Rødby Formation	4580 m
Sola Formation	4604 m
Valhall Formation	4625 m
New Red/Cromer Knoll Group?	4689 m
Zechstein Group?	4734 m
Kupferschiefer Formation?	4768 m
Rotliegendes Group?	4769 m

Well 1/3-5

Biostratigraphy (m BDF):

106 S.B	-	178 m	?Holocene
178	-	400 m	?Pleistocene
400 m			(Early) Pleistocene
480	-	970 m	Pliocene
1050	-	1960 m	Miocene
2050	-	2752 m	Oligocene
2821 m			Oligocene/Eocene
2851	-	3076 m	Eocene
3100	-	3259 m	Paleocene
3259	-	3384 m	?Paleocene
3384	-	3388 m	Upper Maastrichtian
3388	-	3858 m	?Maastrichtian
3858	-	4146 m	Campanian?
4146 m			Upper Campanian
4157 m			Lower Campanian
4170	-	4458 m	Santonian - ?Campanian
4490.4	-	4560 m	Turonian - Coniacian
4560	-	4572.2 m	Cenomanian
4580.5	-	4617.4 m	Lower Aptian/Upper Albian to Cenomanian
4642.2	-	4669 m	?Hauterivian/Barremian
4741	-	4768 m	probably Permian

II.3 TECTONICS

The 1/3-D prospect is located on a high trend in the Northern Permian Basin on the inner eastern margin of the Central Graben. Locally, this high trend of Permian and older strata is named the Hidra High. The objective Rotliegendes reservoirs, lying in the depth range 4750 to 5900 m, are contained in a large, well defined north-eastwards dipping rotated fault block. The structure was formed during the Kimmerian movements from Middle/Late Jurassic to Early Cretaceous, since which time it has been progressively buried to its present depth during the Upper Cretaceous and Tertiary.

II.4 SEISMIC CALIBRATION

Velocity Survey

A velocity survey was carried out by SSL over the interval 300 - 4709 m. Data was recorded at 27 levels with checks levels at 25 m intervals.

An intermediate VSP was also carried out over the interval 2950 - 4700 m. The objective of the VSP was to evaluate the depth of the top Permian reflector.

Stratigraphic Identification of Reflectors

A summary of the Two Way Travel Times (datum MSL) to the most relevant formation tops (datum DF) is given below.

Horizon Top	Depth (m)	TWT(msec)
Rogaland Group	3062	3097
Chalk Group	3288	3249
Cromer Knoll Group	4580	3820
Zechstein Group	4734	3904
Rotliegendes Group	4769	3920

II.5 RESERVOIR CONDITIONS

Well 1/3-5 encountered intervals of limited reservoir potential within the Chalk Group with weak hydrocarbon shows from 3380 m to 3415 m and sporadic shows down to 3800 m. In the absence of core data, it is not possible to determine whether the reservoir potential is enhanced by the occurrence of natural fracturing, reworked chalk or by a combination of both. A petrophysical evaluation indicated the interval to be water-bearing.

Several thin intervals of sandy chalk associated with gas shows have also been encountered below 4230 m. A porosity of 12% for two sand stringers between 4369 and 4388 m, and 16% for a single stringer between 4444 and 4448 m, have been derived from log evaluation, which also indicates marginal hydrocarbon saturation. In the basal part of the Chalk, a porous sucrosic dolomite has been recognised between 4525 and 4530 m. This interval was also associated with gas shows.

The Rotliegendes Group Sandstone (which constituted the prime objective) was penetrated over an 81 m interval (4769 - 4850 m) and was found to be water-bearing. The sandstone has good porosities up to 25%, but low permeabilities. Scanning Electron Microscope investigation shows that authigenic illitic clay minerals, filling pores and coating quartz grains, have been responsible for the significant reduction in permeability.

II.6 DIPMETER SURVEY

A dipmeter was run over the interval 4121 - 4791.5 m. The following comments can be made on the dip patterns shown in the different formations:

1) Hod Formation 3858 - 4524 m

Interval 4121 - 4224 m

This interval shows a complicated dip pattern. Many of the determinations are not reliable. Apart from sedimentary dips, structural dips of about 1-4^{o} SW can probably be distinguished.

Interval 4224 - 4338 m

Structural dips of 1-5^{o} NE seem to be dominant in this interval. Sedimentary dips can also be observed.

Interval 4338 - 4450 m

Mainly sedimentary dips can be recognized in this interval. Structural dips of ca. 2-4^{o} NE are probably also present.

Interval 4450 - 4524 m

Structural dips of 1-2^{o} N-NE are clearly dominant in this interval.

2) Herring Formation 4524 - 4563 m

In the upper part, sedimentary dips are dominant, while in the lower part a structural dip of ca 1^{o} NE is clearly evident.

3) Plenus Marl 4563 - 4568 m

Only structural dips of ca 1^{o} NW can be observed.

4) Hidra Formation 4568 - 4580 m

In the upper part, structural dips of ca 1^{o} NW are dominant. Near the base no dips can be observed.

5) Rødby Formation 4580 - 4604 m

There are only a few dip measurements in this interval.

6) Sola Formation 4604 - 4625 m

This interval shows a complicated dip pattern. Some sedimentary dips seem to be present.

7) Valhall Formation 4625 - 4689 m

This interval too shows a very complicated dip pattern. Many of the measurements are unreliable. No obvious structural dips and only a few sedimentary dips can be distinguished.

8) New Red Group?/Cromer Knoll Group? 4689 - 4734 m

There are only a few dip measurements in this interval.

9) Zechstein? 4734 - 4769 m

Most measurements are unreliable in this interval, although sedimentary dips seem to be evident.

10) Rotliegendes? 4769 - 4791.5 m

Some sedimentary dips can be recognised in this interval.

II.7 CONCLUSIONS

The objective of the well was to test a large structure at Permian sandstone level. The Rotliegendes Sandstone was penetrated over an 81 m interval and was found to be water-bearing. Good porosities but comparatively low permeabilities were recorded from core data. Permeability reduction is attributed to the presence of extensive authigenic illitic clays.

Small intervals interpreted to have some reservoir potential were recorded within the Cretaceous overburden. The weak hydrocarbon shows found in the upper part of the Chalk Group may indicate the presence of some porosity at that level, which is generally the case in the Central Graben area (Ekofisk and Tor Formations). However, a petrophysical evaluation over the limestone confirmed the interval to be water-bearing. A number of sandy chalk stringers of marginal reservoir quality have also been encountered in the middle and lower part of the Chalk Group, together with marginal gas saturation.

No other interval of interest was encountered in well 1/3-5

WELL RESUME
1/3-5
ENCL.4

A/S NORSKE SHELL | Well: 1/3-5 | Core No. 1

CORE DESCRIPTION

Cored from 4805 m to 4814 m Recovered: 9 m 100 % Core size: _____

Formation: Rotliegendes Date: 250185 Described by: Kari Berge Corehead: 5 - 7/8" SHARK

Sheet: 1 of 3

DEPTH & SAMPLES	GRAPHIC LITHOLOGY	GRAIN SIZE (FINE / FINE / MED / CRS / CRS)	SEDIMENTARY STRUCTURES & FEATURES	COLOUR	COMPOSITION (& ACCESSORY MINERALS)	CMT	ESTIMATED Ø %	HYDROCARBON INDICATIONS: SMPL FLU / CUT COL / CUT FLU	GAS %	REMARKS (OIL BLEED; DIPS; FRACTURES ETC.)
4805			∠ low angle	(lt) pk yel orng (red brn)	fSL - fSU srt. - srt. subang. - sub-rnd. elong, friable Traces of pyrite.	mainly sil	good			Traces of red coatings on grains through the whole interval. Fine grained material defines the lamination together with small differences in grain size through the whole interval.
4806			∠ a/a	a/a	fSL - mSL else a/a.					
			∠ a/a	a/a	a/a					
4807			∠ a/a	a/a	a/a					
4808			∠ parallel, low angle				moderate			
				a/a	a/a					
4809				a/a	a/a					

A/S NORSKE SHELL	Well: 1/3-5	Core No. 1

CORE DESCRIPTION

Cored from 4805 m to 4814 m Recovered: 9 m 100 % Core size: _____

Formation: Rotliegendes Date: 250485 Described by: Kari Berge Corehead: 5-7/8" SHARK

Sheet: 2 of 3

DEPTH & SAMPLES	GRAPHIC LITHOLOGY	GRAIN SIZE (FINE / FINE / MED / CRS / CRS)	SEDIMENTARY STRUCTURES & FEATURES	COLOUR	COMPOSITION (& ACCESSORY MINERALS)	CMT	ESTIMATED %	HYDROCARBON INDICATIONS: SMPL FLU	CUT COL	CUT FLU	GAS %	REMARKS (OIL BLEED; DIPS; FRACTURES ETC.)
4809			parallel, low angle	pk yel orng (redbrn)	fSL - fSU (mSL) Subang. - subrnd. srt. - srt. Elong, friable Traces of pyrite.	mainly sil. traces of carb. (dol.).	good-moderate					Traces of red coating on grains through the whole interval. Relatively higher content of clay lamination which defines the bedding.
4810			(parallel)									
			a/a	a/a	a/a							
												Bedding is observed due to differences in grainsize.
4811												
			high angle	a/a	a/a							
				(lt) pk wh			moderate					Abrupt change in colour due to diagenetic features - leaching ?
4812												
			a/a	pk yel orng (redbrn)	a/a							
			parallel, low angle	(lt) pk yel orng brn								
4813							good					

WELL RESUME
1/3-5
ENCL.4

A/S NORSKE SHELL | Well: 1/3-5 | Core No. 1

CORE DESCRIPTION

Cored from 4805 m to 4814 m Recovered: 9 m 100 % Core size:

Formation: Rotliegendes Date: 250485 Described by: Kari Berge Corehead: 5-7/8" SHARK Sheet: 3 of 3

DEPTH & SAMPLES	GRAPHIC LITHOLOGY	GRAIN SIZE (VFINE / FINE / MED / CRS / CRS)	SEDIMENTARY STRUCTURES & FEATURES	COLOUR	COMPOSITION (& ACCESSORY MINERALS)	CMT	ESTIMATED %	HYDROCARBON INDICATIONS: SMPL FLU	CUT COL	CUT FLU	GAS %	REMARKS (OIL BLEED; DIPS; FRACTURES ETC.)
4813			(═) low angular	pk yel orng (brn) (red) a/a	fSL – mSL subang. – sub. rnd srt. – srt. elong, friable Traces of pyrite a/a	sil (dol)	good					The grains show good orientation. Traces of red coatings
4814												

WELL 1/3-5 SWS

SAMPLE RECOVERY SUMMARY:

1) 8 1/2" hole section: 4139 - 4395 m

attempted: 25 bullets (1 run)

recovered: 14 bullets

misfired: 5 bullets

empty : 0 bullets

lost : 6 bullets

2) 5 7/8" hole section: 4395 - 4850 m

attempted: 72 bullets (2 runs)

recovered : 51 bullets

misfired : 2 bullets

empty : 2 bullets

lost : 17 bullets

WELL 1/3-5 SWS

DEPTH (m)	RECOVERY (mm)	LITHOLOGY
4146.0	10	LST: LTGY, 1(-2)A MDST, MOD HD, (TR)MICROFOS, (ARG), BLKY-ANG
4157.0	10	LST: PABRNGY, ELSE A/A
4170.0	5	LST: LTGY,MOD HD-HD, ELSE A/A
4179.0	LOST	
4193.0	5	LST: OFF WH, MOD HD-HD, 1(-2) A MDST, BLKY-ANG, ((ARG)), (TR)MICROFOS
4202.0	LOST	
4214.5	8	LST: LT-MED BRNGY, MOD HD-HD, 1A MDST, ARG, BLKY-ANG
4222.0	LOST	
4233.5	CHIPS	LST: OFF WH-LTGY, MOD HD, 1(-3) A MDST, (ARG), BLKY-PLTY
4250.0	8	LST: LTGY-PABRNGY, 1(-2)A MDST, MOD HD, (ARG), BLKY-ANG, (TR)MICROFOS
4263.5	MISFIRE	
4269.5	LOST	
4287.0	MISFIRE	
4304.5	10	LST: PABRNGY, ELSE A/A
4309.5	MISFIRE	
4324.5	LOST	
4337.0	5	LST: LT-MED BRNGY, 1A MDST, ARG, MOD HD-HD, TR GY ARG PATCH/STRKS, BLKY, (HYGROTURGID)
4355.0	15	LST: MED BRNGY, 1A MDST, ARG, BLKY, SFT-MOD HD, BLKY, (HYGROTURGID)
4366.0	5	LST: OFF WH, 1-2 A MDST, MOD HD, ((ARG)), (TR)MICROFOS, BLKY
4369.0	8	LST: LT BRN MTL W OFF WH, 2-3 A MDST, (ARG), (SLT)-(V F SL), TR GLC, SFT-MOD HD, BLKY. NO-V DULL(BRN) DIRECT FLU, V WEAK-V SLOW MILKY WH CUT FLU
4373.0	LOST	
4383.0	15	LST: OFF WH-BUFF, 1-2 A MDST, ((ARG)), (SLT)-V(V F SL), SFT-MOD HD, BLKY, TR GLC, STYL W DK MAT + PYR. V PALE (WH-YEL) FLU, V WEAK-V SLOW MILKY WH CUT FLU

WELL 1/3-5 SWS

DEPTH (m)	RECOVERY (mm)	LITHOLOGY
4385.0	MISFIRE	
4390.0	10	LST: LT-MED BRN GY, 1 A MDST, (ARG), MOD HD-HD, TR GY ARG PATCH/STRKS, BLKY
4395.0	MISFIRE	
4399.4	20	LST: LT BRN GY, 1-2A MDST, (MTL), ARG, (HD), MOD HD, (TR) MICROFOS, HYGROTURGID. NO DIRECT FLU; X SLOW, WEAK PA(WH)-(YEAL) CUT FLU
4402	10	LST: LT(BRN) GY A/A, NO FLU/NO CUT
4408.5	10	LST: MED BRN GY, 1-2A MDST, (MTL) ARG, (HD)-MODHD, (SLT), HYGROTURGID. NO DIRECT FLU; X SLOW, WEAK PA (WH)-(YEL) CUT FLU
4429	8	LST: LT BRN GY, 1A MDST, ((ARG)), HD-(HD), (GLC), (HYGROTURGID). NO FLU/NO CUT
4444.2	LOST	
4446.5	LOST	
4458	10	LST: LT(GN)GY, 1-2A MDST, (ARG)-ARG, (HD)-MOD HD, GLC, HYGROTURGID, (TR)MICROFOS
4480	15	LST: MED BRN GY, MTL, 1-2A MDST,ARG,(SLT), (HD)-MOD HD, GLC,(HYGROTURGID). NO DIRECT FLU; X SLOW, V WEAK V PA (WH) CUT FLU
4486.2	15	LST: SFT-(HD),HYGROTURGID,ELSE A/A, FLU A/A
4490.5	10	LST: A/A, FLU A/A
4493.5	10	LST: LT(BRN)GY W DK GY ARG/CARB LAMS, ARG-ARG,SFT-(HD), GLC,(SLT), HYGROTURGID. NO DIRECT FLU; X SLOW, X WEAK V PA (WH)-(YEL) CUT FLU
4512.8	10	LST: LT GY-OFF WH, 1-2A MDST, SFT-MOD HD,GLC, ((ARG)),HYGROTURGID.NO FLU/NO CUT
4515.2	10	LST: LT GY-OFF WH W PATCHES MED BRN GY MTL, (GLC),(ARG)-ARG, (HD)-MOD HD, (HYGROTURGID). NO FLU/NO CUT
4522.0	LOST	
4525.0	20	LST: MED BRN GY,MTL,ARG,SLT,VFS(GRD TO SST), SFT,(HD),HYGROTURGID. NO DIRECT FLU; X SLOW, X WEAK V PA (WH) CUT FLU

WELL 1/3-5 SWS

DEPTH (m)	RECOVERY (mm)	LITHOLOGY
4527.4	10	LST: BUFF-OFF WH, 3A MDST,MOD VIS POR,SFT-(HD),(GLC),(ARG),(DOL),HYGROTURGID. NO FLU/NO CUT
4528.8	15	LST: LT GY-OFF WH-BUFF,1-2A MDST,((GLC)), SFT-MOD HD,ARG,(DOL),HYGROTURGID. NO FLU/NO CUT
4540.2	10	SST: MED(BRN)GY,VFS,SLT/ARG,CALC/DOL,SRT,OCC TR FSL,PYR,STICKY,(MIC),((HYGROTURGID)). NO FLU/NO CUT
4548.8	10	LST: LT GY BRN,(MTL),(VFS),SLT,ARG,1-2A MDST, GLC,OCC 3A MDST,HYGROTURGID,(HD)-MOD HD. NO FLU/NO CUT
4555.2	15	LST: LT GY-MED BRN GY PATCHES,SLT,ARG,VFS (GRD TO SST),SFT-(HD),((HYGROTURGID)), (GLC).NO FLU/NO CUT
4560.0	5	LST: LT(GN)GY,SLT,ARG,VFS(GRD TO SST),SFT-HD, GLC,MIC,HYGROTURGID
4564.5	EMPTY	
4567.2	LOST	
4572.2	10	LST: LT-MED BRN GY,SLT,ARG,VFS,(GRD TO SST), SFT-MOD HD,GLC,HYGROTURGID.NO FLU/NO CUT
4580.5	15	CLST: BRN RED,(MIC),SFT-MOD HD,(SLT), HYGROTURGID
4587.2	LOST	
4592.2	5	LST: LT GY-LT BRN GY, 1A MDST,SFT-MOD HD, ARG,DOL,(SLT),(VFS),PYR,(HYGROTURGID), ((GLC))
4599.8	15	LST: LT GN GY-LT BRN GY, SFT-(HD),STICKY, (HYGROTURGID),ARG(GRD TO MRL),1-2A MDST
4605.7	15	LST: BUFF-MED BRN GY,MTL,SFT-MOD HD,ARG,SLT, VFS(GRD TO SST),GLC,(HYGROTURGID)
4612	25	LST: MED GN GY-MED BRN GY,SFT-(HD),ARG,STICKY (SLT),(VFS),HYGROTURGID,(GRD TO MRL)

DEPTH (m)	RECOVERY (mm)	LITHOLOGY
4617.4	10	LST: BUFF,1-2A MDST,MICROFOS,(GLC),SFT-MOD HD, ((ARG)),((HYGROTURGID))
4623.7	20	CLST: DK(BRN)GY,CARB,(CALC)/(DOL),SFT-(HD), (SLT),(VFS),(MIC).NO FLU; MOD-WEAK PA (YEL)-(WH) CRUSH CUT
4627.4	20	MRL: LT GN GY,CALC,SFT-(HD),STICKY,SLT,VFS,PYR, (HYGROTURGID),(DOL)
4642.2	10	LST: LTGY,ARG(GRD TO MRL),SFT-(HD),STICKY, 1A MDST,(HYGROTURGID),(DOL)
4651.5	25	CLST: RED BRN-PURPLE,SFT-(HD),STICKY,(CALC)/ (DOL),SLT,VFS,HYGROTURGID
4661.4	LOST	
4670.5	10	CLST: RED BRN,SFT-(HD),STICKY,SLT,VFS (GRD TO SST),HYGROTURGID,(CALC)/(DOL)
4676.5	10	LST: BUFF-LT BRN GY,VFS(OCC FS) GRD TO SST, ARG/SLT,GLC,SFT,(HYGROTURGID),(DOL)
4689.6	3	LST: LT-MED BRN GY,MTL,VFS(OCC FS)GRD TO SST, ARG/SLT,SFT-MOD HD, (HYGROTURGID),(DOL)
4697.4	25	CLST: RED BRN,SFT-(HD),SLT,VFS,MIC,(CALC), ((HYGROTURGID))
4704.1	LOST	
4713.4	CHIPS	CLST: A/A (CHIP ONLY, MAINLY MUD CAKE)
4723.5	3	LST: GNGY,SLT,VFS(LOC FS)GRD TO SST,ARG,GLC, SFT,STICKY,HYGROTURGID
4729.2	15	CLST: RED BRN, A/A
4735.2	20	SST: OFF WH-DK GY PATCHES,VFS(-FS),(ARG),SFT-(HD),STICKY,HYGROTURGID
4736.5	LOST	
4739.2	25	CLST: RED BRN-PURPLE GY,SFT-(HD),(SLT),(VFS), (CALC)/(DOL),STICKY,(HYGROTURGID)
4740	MISFIRE	
4742	15	CLST: A/A
4744	MISFIRE	

WELL 1/3-5 SWS

DEPTH (m)	RECOVERY (mm)	LITHOLOGY
4745.5	LOST	
4747.5	LOST	
4748.3	5	ANHYD(?)/(ANH SST?): WH-CLR,TRANSP/ TRANSL,CRYST,SFT,CRUMBLY,(SLT)/(VFS), (DOL),POS REACTION WITH BA CL
4752	15	CLST/SST: RED BRN-GY RED,ARG/SLT,VFS,(CALC)/ (DOL),MIC,SFT,STICKY,HYGROTURGID
4754.2	LOST	
4755.5	LOST	
4757.5	LOST	
4759.5	LOST	
4762.5	5	DOL LST: MED BRN GY,MTL,SFT,(HD),ARG,SLT,VFS (GRD TO SST),HYGROTURGID,DIRTY, (3A MDST)
4764.5	8	DOL LST: A/A, DK GY ARG LAMS
4768	LOST	
4768.5	LOST	
4770	LOST	
4774.7	LOST	
4778.5	10	SST: WH,CLR,TRANPS/TRANSL,FSU-MSL(FSL-MSU), SRT-SRT,V POOR CMT,(PYR),(ANG)-(RND), (ELONG)-(SPH),OCC FROSTED,OCC((DOL)), (SLT),(MOD)-GOOD POR
4780.5	10	SST: A/A
4784.0	10	SST: FSU-MSU (FSL-CRS SL),(ANG)-RND,SRT, ELSE A/A
4789.5	5	SST: FSL-FSU(FSL-MSL),ELSE A/A
4795	5	SST: FSL-FSU(FSL-MSU),(TR)PK GRNS, ELSE A/A
4801	10	SST: PK-LT ORNG YEL-(RED),PARTLY(RED) COATED GRNS ARG?/HEMATITE?,SRT,FSU-MSL (FSL-MSU),(ANG)-RND,V POORLY CMT,(MOD)-GOOD POR,(ELONG)-(SPH),(DOL),TR DK GRNS, TRANSP/TRANSL-FROSTED
4830.5	10	SST: A/A
4843.5	10	SST: A/A