

**Final Well Report
PL 128
Well 6608/10-9**

03D94*5880

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1 Introduction

1.1 Well data record

Well name : 6608/10-9
Type of well : Wildcat
Prospect : Lerke
Country : Norway
Area : Nordland II
License : PL 128
Licencees : Statoil ASA (Operator) 40.45 %
 Petro AS 24.55 %
 Norsk Hydro ASA 13.50 %
 Norsk Agip A/S 11.50 %
 AS Norske Shell 10.00 %

Drilling unit : Deepsea Bergen
Type : Semi submersible drilling rig
Water depth : 377 mMSL
Air gap : 23 m
On license : 19.01.03
Rig release : 20.02.03
Formation at TD : Åre Formation

Geographic co-ordinates : 66° 03' 44.15" N
 08° 13' 19.57" E
Datum/Spheroid : ED-1950 / Int. 1924

UTM : UTM Zone 32, CM 09° E
 7 327 254N
 464 779E

Seismic location : Seismic survey ST0103, Inline 1268, Cross-line 2342.

All depths in this report refer to RKB (Rotary Kelly Bushing) unless otherwise stated.

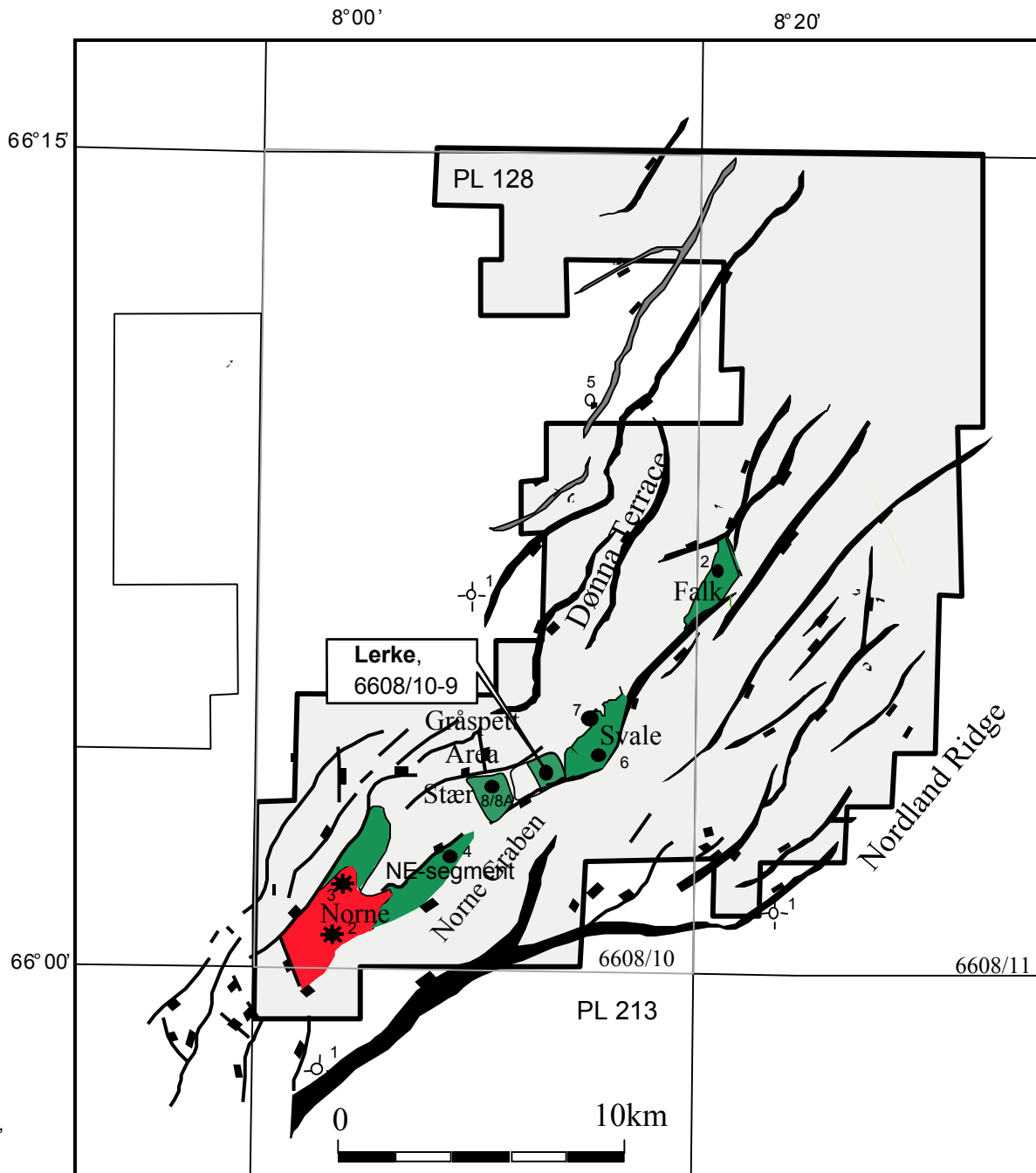


Fig. 1.1

1.2 Well objectives

The main objective of well 6608/10-9 was to prove hydrocarbons in the Lower Jurassic sandstones of the Tilje and Åre Formations in the Lerke prospect. The secondary objective was to prove hydrocarbons in the Upper Jurassic sandstones of the Melke Formation.

Well 6608/10-9 proved that the Melke sandstones were oil bearing, whilst the Tilje and Åre sandstones were water filled.

1.3 Result of the wells

Well 6608/10-9 was spudded in a water depth of 377 mMSL and drilled to a total depth of 2400 m. No shallow gas was observed by the ROV at the wellhead.

Three sandstones were penetrated and proven to be oil-bearing in the Melke Formation. No oil-water contact was proven. Pressure gradients in the reservoir indicates an oil down to situation in the Melke Formation. This was verified both by shows in cores, logs, samples and laboratory studies of the cores. The main part of the oil bearing reservoir zone was cored in 6608/10-9. The Not, Tilje and Åre Formations were water filled. This was verified by wireline logs and MDT pressure points which proved a water gradient.

MDT oil samples were collected from the Melke sandstones in 6608/10-9. The oil in the samples confirmed a composition very similar to the "Norne oil".

1.4 Drilling summary

1.4.1 Casing

A 30" conductor was run with the shoe at 458.5 m. In addition a 13 3/8" casing was run with the shoe at 1305 m.

Table 1.1 Casing

Casing	Shoe depth	Leak off tests
30"	458.5 m	
13 3/8"	1305 m	1.72 g/cm ³ (extended LOT)

1.4.2 Drilling fluids

Table 1.2 Drilling fluids

Section	Section TD	Maximum mud weight [g/cm ³]	Mud type
36"	460.5	1.03	Sea water / high visc. sweeps
17 ½"	1311	1.03	Sea water / high visc. Sweeps
8 ½"	2400	1.34	Glydril (water based KCl/glycol/polymer)

1.5 Data acquisition summary

See Figure 1.2.

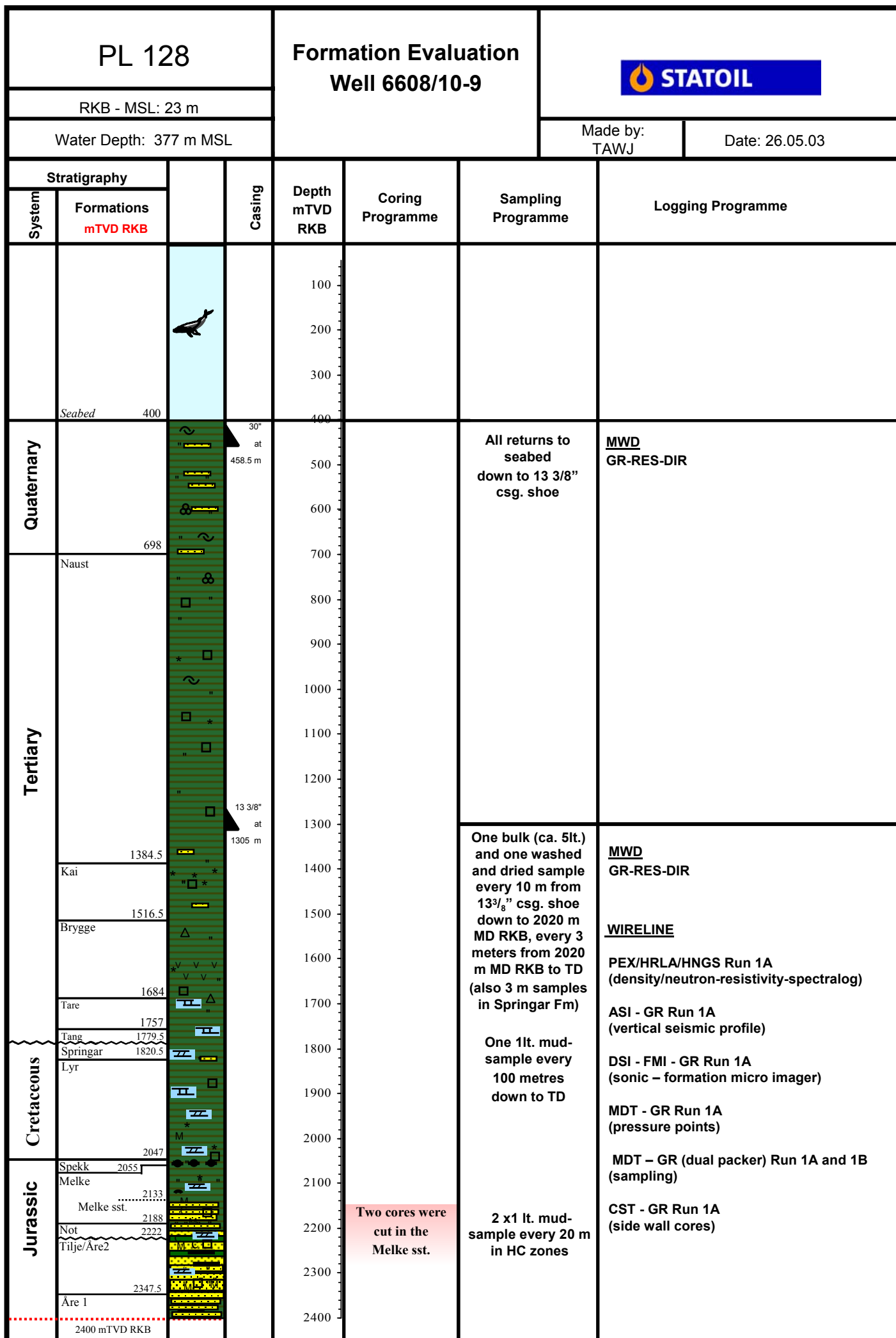


Fig. 1.2

2 Exemptions and non-conformances

2.1 Exemptions and non-conformances from NPD's regulations

None

2.2 Exemptions and non-conformances from Statoil's regulations

Table 2.1 Exemptions and non-conformances

Exemption from	Date	Title
WR0442: Planning of drilling & well operations	11.11.02	Exemption from requirement of "Peer review", Synergi number: 200616
WR1151: Utslipsbegrensninger og driftsoppfølging	05.02.03	Change in discharge permit. Synergi number: 208058

Non-conformances : none

3 Health, safety, environment and quality (HSE&Q)

3.1 RUH

Table 3.1 RUH reporting

No RUH	Odfjell/Service	Statoil
138	137	1

All RUH's for the well were reported through Odfjell's reporting system. Due to this the RUH's are not divided into company and category. All RUH's from the Lerke well are closed in Synergi.

3.2 Comments to RUH

The cooperation with Odfjell Drilling AS has been very good. Odfjell has shown a very good attitude and willingness to take action and close observations from inspections etc. on the rig. On the rig Odfjell has shown very good cooperativeness and puts safety first.

3.3 Experience summary

Table 3.2 Experience summary

Wellbore: 6608/10-9

Section	Down Time time (hrs)	Experience Impr. (hrs) (subject and description)	Immediate solution	Solution recommended for future
MOVE 19.01.2003		Rig move: Using 2 boats, towing on anchor chains. Advantages: 2 boats means 2 barriers against breaking towing gear and get a rig on drift. The anchor chains are more "flexible", and the boats are pulling very steadily with 80 tons each. According to Odfjell, one can only use 60-70 ton when using the normal towing gear. Towing speed has been up to almost 9 knots, even with 40 knots head wind, the speed was 6 knots.		If possible, use two towing boats towing on anchor chains for long distance rig moves.
36" 23.01.2003		Drilling 36" hole from seabed at 400 m to 460,5 m Used many hours when spudding the well, due to bad weather and heave movement on the rig. It was difficult to maintain low weight on bit to avoid building inclination. The bit and holeopener had rounded gauge and worn shirt tail. Only a few teeth were missing on the holeopener. Experienced hard formation and a lot of small boulders.	N/A	N/A
27.01.2003	0	0 Had problems with readings of inclination from Andergauge tool due to movement/positioning of the rig. Should have more focus on positioning of the rig. Cracked and slight damage of 30" conductor shoe Primary cement shoe had hairline cracks. Marks and cement flakes missing along outer rim also indicated shoe had been dented prior to arrival on rig. Ran backup shoe.	Ran backup shoe.	Proper inspection/control prior to shipment.
17 1/2" 28.01.2003		Drilling ROP and BHA Used aggressive milled tooth bit IADC-code = 115 when drilling 17 1/2" section from 460 m to 1311 m, with very good result and high ROP. The formation was soft shale and boulders. Used pendulum assembly when drilling this vertical section with very good result.	N/A	This solution is recommended for future wells in this area.
30.01.2003		2.5 Casing running The 13 3/8" casing was not doped onshore. Had problems when running casing due to cleaning and doping of casing on drillfloor in cold weather < 0 degrees. Ice forming on threads and seal areas.	Had to hot steam threads on pipe deck and drill floor and apply running dope on drill floor, using approximately 2.5 hrs of extra rig time.	Casing to be doped onshore and shipped out to the rig ready-to-run.
8 1/2" 18.02.2003		Avoided bit balling There was not experienced any signs of bit balling, even though the BHA stabilisers where found to be heavily balled up. This is believed to be mainly caused by design of the 5-blaede steel body PDC bit and the high HSI values obtained (in the region between 7-8).	N/A	Aggressive bit with high open face volume and high HSI to avoid bit balling is recommended for drilling these formations.
18.02.2003		KCl content in mud The water based KCl/polymer/glycol drilling fluid was at first run with	Increased the KCl content and glycol	It is recommended for future wells in this area to keep the

		a glycol content at approximately 3.5% and a KCl content of 120-130 kg/m ³ . This proved to be insufficient to avoid problems with sticky clay down hole. Towards the end of the section the glycol content was raised to 4% and the KCl content to around 140 kg/m ³ .	content as much as chemical stock onboard the rig allowed.	glycol content at 5% and keep the KCl levels in the region between 140 - 160 kg/m ³ .
18.02.2003	0	Overgauge modular stabilisator 8 1/2" pre-made assembly was sent out to the rig with a 1 mm overgauge modular stabilisator. The backup modular stabilisator was also found overgauge.	Ran in hole with overgauge stabilisator.	Improve inspection procedures onshore prior to shipping out equipment.

3.4 Time distribution

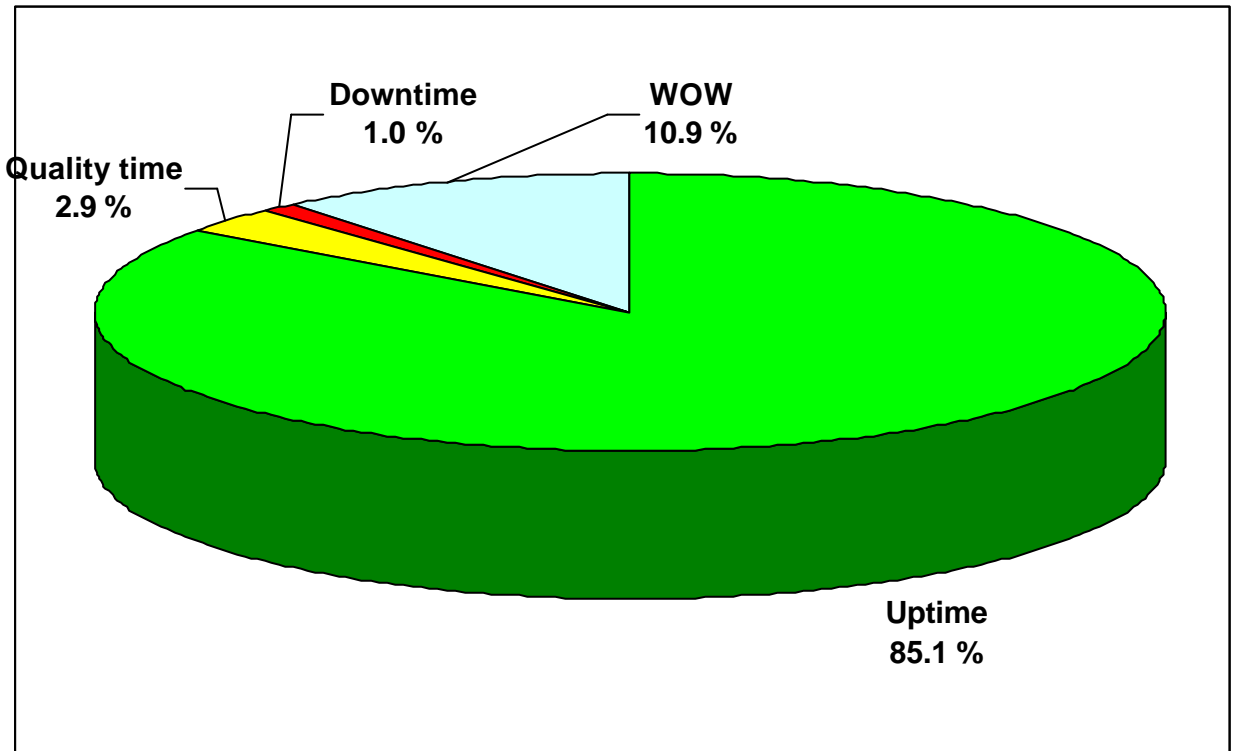
Table 3.3 Time distribution

Planned total time (including changes in scope of work)	46.9 days
Actual total time	31.8 days
Total down time	7.5 hrs
Waiting on weather (WOW)	83.5 hrs

Table 3.4 Operations factor

Ops. Factor: $= \frac{\text{Total_time} - \text{Down_time} - \text{WOW}}{\text{Total_time} - \text{WOW}} * 100$	98.9 %
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Fig. 3.1 D-time distribution



4 Geology and formation data report

4.1 Geological setting and results

The structural framework on the Dønna Terrace was established during the Upper Jurassic/Lower Cretaceous extensional tectonics in the region. Later structuring is mainly related to the Cretaceous and Tertiary basinal subsidence. The Lerke structure is downfaulted relatively to the Svale discovery in the northeast and Stær discovery in the southwest. In the northwest-southeast direction the Lerke structure is a distinct horst between the Gråspett area and the “Norne Graben” (Fig. 1.1).

Block 6608/10 is situated in the southern part of the Nordland II area. The NE-SW trending Revfallet Fault Complex separates the block in two structural provinces, the Nordland Ridge and the Dønna Terrace (Fig. 1.1). Well 6608/10-9 is located on the Dønna Terrace in the south central part of block 6608/10.

Wells 6608/10-9 penetrates rocks of Quaternary, Tertiary, Cretaceous and Jurassic age. TD of the well is in rocks of Jurassic age in the Åre Formation (Fig. 4.1).

4.2 Shallow gas results

The well was classified as class 0 - no shallow gas expected. The well was drilled with seawater down to 1305 mMD. No shallow gas was observed.

4.3 Stratigraphy

The stratigraphical division is based on the biostratigraphic report, wireline log curves and on correlation with nearby wells. The stratigraphy of the entire well and the reservoir section is shown in Figures 4.1-3.

4.3.1 Table of chronostratigraphy

Table 4.1 Chronostratigraphy

Stratigraphic succession		mMD		
	Studied interval 1320 – 2400 mMD	From	To	
Tertiary	Upper? Pliocene (top not seen)	1320	1340	
	Lower Pliocene	1350	1360	
	Upper Miocene	1370	1500	
	Middle Miocene	1510	1550	
	Lower Miocene	1560	1583.35	
	-----Unconformity-----			
	Lower Oligocene	1583.35	1607.91	
	-----Unconformity-----			
	Upper Eocene	1607.91	1620	
	Middle Eocene	1630	1662.92	
	Lower Eocene	1662.92	1733.86	
	Upper Paleocene	1733.86	1755.64	
	----- intra Paleocene unconformity -----			
	Upper Paleocene	1755.64	1779.5	
----- Base Tertiary unconformity -----				
Cretaceous	Lower Maastrichtian	1779.5	1800.19	
	Upper Campanian	1800.19	1810.55	
	Middle Campanian	1810.55	1820.5	
	-----Unconformity-----			
	Upper Barremian	1828	2010	
	Lower Barremian	2020	2047	
----- Base Cretaceous unconformity -----				
Jurassic	Upper Oxfordian	2048	2050	
	Upper Oxfordian	2056	-	
	Middle Oxfordian	2058	2080	
	Upper Callovian	2083	2086	
	Upper Bathonian	2092	2104	
	Lower Bathonian	2113	2122	
	Upper Bajocian	2128	2178.5	
	Lower Bajocian	2193.5	2196.5	
	Middle Aalenian	2198	2213.5	
	Middle Aalenian	2215.5	2221.3	
	-----Unconformity-----			
	?Upper Pliensbachian	2223	2227	
	Lower Pliensbachian – Sinemurian	2228	2363	
	Hettangian	2363	2400	
	TD	2400		

4.3.2 Table of lithostratigraphy

Table 4.2 Lithostratigraphy

Table of lithostratigraphy					
Period	Group / Formation	Observed depth			TWT sec.
		mMD	m TVD	m MSL	
QUATERNARY	NORDLAND GROUP. (Sea Floor)	400.0	400.0	377.0	0.484
TERTIARY	Naust Formation	698.0	698.0	675.0	0.806
	Kai Formation	1384.5	1384.5	1361.5	1.366
	HORDALAND GROUP	1516.5	1516.5	1493.5	1.478
	Brygge Formation	1516.5	1516.5	1493.5	1.478
	Tuff Marker	1608.5	1608.5	1585.5	1.566
	ROGALAND GROUP	1684.0	1684.0	1661.0	1.639
	Tare Formation	1684.0	1684.0	1661.0	1.639
	Tang Formation	1757.0	1757.0	1734.0	1.705
CRETACEOUS	SHETLAND GROUP	1779.5	1779.5	1756.5	1.725
	Springar Formation	1779.5	1779.5	1756.5	1.725
	CROMER KNOLL GP.	1820.5	1820.5	1797.5	1.761
	Lyr Formation	1820.5	1820.5	1797.5	1.761
JURASSIC	VIKING GROUP	2047.0	2047.0	2024.0	1.930
	Spekk Formation	2047.0	2047.0	2024.0	1.930
	Melke Formation	2055.0	2055.0	2032.0	1.936
	Melke Fm, Sst mbr	2133.0	2133.0	2110.0	1.995
	FANGST GROUP	2188.0	2188.0	2165.0	2.034
	Not Formation	2188.0	2188.0	2165.0	2.034
	Not Fm, Sst mbr	2204.0	2204.0	2181.0	2.045
	BÅT GROUP	2222.0	2222.0	2199.0	2.057
	Tilje Formation	2222.0	2222.0	2199.0	2.057
	Åre 2 Formation	2228.0	2228.0	2205.0	2.061
	Åre 1 Formation	2347.5	2347.5	2324.5	2.142
	TD	2400.0	2400.0	2377.0	-

4.4 Lithostratigraphic description

NORDLAND GROUP **400.0 - 1516.5 mMD, 400.0 - 1516.5 mTVD**
(377.0 – 1493.5 mTVD MSL)

The Nordland Group comprises the Quaternary, the Naust and the Kai Formations. The upper part of the Nordland Group, including Quaternary and the major part of the Naust Formation, was drilled with all returns to the seafloor. Lithology down to 1320 m is inferred from the MWD memory log and cuttings descriptions from the offset wells.

Quaternary **400.0 - 698.0 mMD, 400.0 - 698.0 mTVD**
(377.0 – 675.0 mTVD MSL)

System: Quaternary
Series: Pleistocene (Samples analysed from 1320 mMD)

The Quaternary sediments consist mainly of thick clay units interbedded with sandy intervals and layers. Based on the gamma ray log the sandy layers are inferred to be silty and argillaceous.

Naust Formation **698.0 – 1384.5 mMD, 698.0 – 1384.5 mTVD**
(675.0 – 1361.5 mTVD MSL)

System: Tertiary
Series: Upper? - Lower Pliocene - Upper Miocene (Samples analysed from 1320 mMD)

The boundary to the overlying Quaternary sediments is picked below a slight increase on the resistivity log, consistent with previous wells in the area. The MWD logs suggest that the predominant lithology in the Naust Formation is claystone, slightly sandy and silty in parts with no distinct sandstone units encountered.

The claystone is medium green grey, predominantly soft, amorphous and slightly calcareous.

The sand consists of clear to translucent quartz and mineralized feldspar. It is silty to fine, trace medium to coarse, loose and floating in claystone. There are traces of lithic fragments and limestone. The limestone is off white, firm, blocky and cryptocrystalline to micritic.

Kai Formation 1384.5 – 1516.5 mMD, 1384.5 – 1516.5 mTVD
(1361.5 – 1493.5 mTVD MSL)

System: Tertiary

Series: Upper - Middle Miocene

Depositional environment: Marine, inner, mid to outer shelf

The top of the Kai Formation is picked at a trend shift towards higher gamma ray log readings associated with a shift in resistivity, density, porosity and sonic logs. The Kai Formation consists mainly of claystone with minor to good traces of sand/rock fragments and limestone.

The claystone is medium to dark green grey and olive grey to medium dark grey. It is persistently soft, non calcareous and with silty and sandy laminae or floating arenaceous components. There are traces to abundant amounts of glauconite.

The sand consists of clear to translucent quartz and mineralized feldspar. It is silty to fine, occasional medium to coarse, loose and floating in claystone. The sand is becoming generally very arenaceous with lithic fragments.

The limestone is off white, firm, blocky and cryptocrystalline to micritic.

HORDALAND GROUP 1516.5 - 1684.0 mMD, 1516.5 - 1684.0 mTVD
(1493.5 – 1661.0mTVD MSL)

The top of the Hordaland Group is defined by the sonic log, which shows a trend shift towards lower velocity. The Hordaland Group comprises the Brygge Formation.

Brygge Formation 1516.5 - 1684.0 mMD, 1516.5 - 1684.0 mTVD
(1493.5 – 1661.0mTVD MSL)

System: Tertiary

Series: Middle Miocene - Lower Eocene

Depositional environment: Marine, mid to outer shelf to upper bathyal

The Brygge Formation consists of an upper claystone unit with some limestone beds in the lower part. From 1608.5 MD m an undifferentiated tuffaceous zone was encountered. The top of the tuffaceous zone is defined by a trend shift in resistivity towards lower values, associated with a drop in sonic log velocity.

The claystone is predominantly olive grey to brownish grey, becoming medium to dark greenish grey. It is soft, amorphous, subblocky and sticky, with abundance of green

glaucanite and it is all none calcareous. The tuffaceous claystone is medium grey and bluish grey, firm, blocky and with patchy glauconitic specks.

The limestone is light grey to off white, firm, blocky and cryptocrystalline.

ROGALAND GROUP **1684.0 – 1779.5 mMD, 1684.0 – 1779.5 mTVD**
(1661.0 - 1756.5 mTVD MSL)

The top of the Rogaland Group is picked from log correlation of gamma ray and resistivity with neighbour wells 6608/10-4 and 10-8. The resistivity log response is generally building to a higher level than in the Brygge Tuff/Tuffaceous unit above.

Tare Formation **1684.0 – 1757.0 mMD, 1684.0 – 1757.0 mTVD**
(1661.0 - 1734.0 mTVD MSL)

System: Tertiary

Series: Lower Eocene – Upper Paleocene

Depositional environment: Marine, outer shelf to upper bathyal

The Tare Formation is composed of claystone and tuffaceous claystone with minor stringers of limestone.

The claystone is predominantly olive grey to dark brownish grey, blocky, firm and non calcareous. Becoming also moderate green with slight traces of micropyrrite.

The tuffaceous claystone is medium grey to olive grey in colour. It is firm, blocky and has a waxy appearance. Below 1730 m MD the claystone is becoming less tuffaceous.

The traces of sand are seen as loose quartz grains. The limestone is light grey to olive grey, firm, brittle and slightly argillaceous.

Tang Formation **1757.0 – 1779.5 mMD, 1757.0 – 1779.5 mTVD**
(1734.0 - 1756.5 mTVD MSL)

System: Tertiary

Series: Upper Paleocene

Depositional environment: Marine, outer shelf to upper bathyal, shallowing to marine, outer shelf

The top of the Tang Formation is picked at an increase in the gamma log response where the sonic log has a shift towards lower values. There is little change in the resistivity log. The Tang Formation consists predominantly of claystone with traces of limestone.

The claystone is predominantly moderate green to pale green, but also dark grey to olive grey. It is firm, blocky, in parts tuffaceous and is occasionally slightly silty. It is also consistently non calcareous and has traces of micropyrrite.

The limestone is light grey to olive grey and firm to brittle and slightly argillaceous.

SHETLAND GROUP **1779.5 – 1820.5 mMD, 1779.5 – 1820.5 mTVD**
(1756.5 – 1797.5 mTVD MSL)

The top of the Shetland Group is picked at a high gamma ray peak. The peak is associated with a trend shift in the resistivity log response to higher levels than seen in the overlying Tang Formation. In this well the Shetland Group comprises the Springar Formation.

Springar Formation **1779.5 – 1820.5 mMD, 1779.5 – 1820.5 mTVD**
(1756.5 – 1797.5 mTVD MSL)

System: Cretaceous

Series: Upper Cretaceous

Stage: Lower Maastrichtian – Middle Campanian

Depositional environment: Marine, outer shelf to upper bathyal

The Springar Formation consists of claystone with minor stringers of limestone.

The claystone is predominantly dark grey to olive grey, occasionally brown grey. It is firm, blocky, occasionally silty and predominantly non calcareous.

The limestone is light grey to off white and olive grey in colour. It is blocky, firm to brittle, argillaceous and slightly sandy.

Traces of sand are seen as loose quartz, and glauconite is seen as both grains and occasionally nodules. Traces of pyrite are also found.

CROMER KNOLL GROUP **1820.5 – 2047.0 mMD, 1820.5 – 2047.0 mTVD**
(1797.5 – 2024.0 mTVD MSL)

The top of the Cromer Knoll Group, which comprises the Lyr Formation in this well, is defined by a significant increase in resistivity values compared to the Shetland Group. The gamma ray readings increase slightly compared to the general level in the lower part of the Shetland Group.

Lyr Formation **1820.5 – 2047.0 mMD, 1820.5 – 2047.0 mTVD**
(1797.5 – 2024.0 mTVD MSL)

System: Cretaceous

Series: Lower Cretaceous

Stage: Upper - Lower Barremian

Depositional environment: Marine, shelf to mid shelf

The Lyr Formation consists of claystone with interbedded limestone stringers, and occasional sandstone stringers in the lower part.

The claystone is olive grey, firm, massive, sticky, silty and non calcareous. It is becoming firmer and less sticky and very arenaceous in lower part. There are good traces of pyrite throughout the formation.

The limestone is light grey to off white, olive grey, blocky, firm to brittle, slightly argillaceous, slightly sandy and dominant micritic.

The sands are composed of clear translucent quartz grains. The grains are subangular, predominantly fine to medium, moderate sorted and loose.

VIKING GROUP **2047.0 – 2188.0 mMD, 2047.0 – 2188.0 mTVD**
(2024.0 – 2165.0 mTVD MSL)

The top of the Viking Group is defined by a sharp increase in the gamma ray log response. This is associated with a drop in the resistivity log readings and a significant drop in sonic log velocity. The Viking Group comprises the Spekk and the Melke Formations in this well.

Spekk Formation **2047.0 – 2055.0 mMD, 2047.0 – 2055.0 mTVD**
(2024.0 – 2032.0 mTVD MSL)

System: Jurassic

Series: Upper Jurassic

Stage: Upper Oxfordian

Depositional environment: Marine, mid shelf

The Spekk Formation is only 8 meters thick and consists of a dark organic rich shaly claystone with thin limestone stringers.

The claystone is described as brownish black to dusky brown to dusky yellowish brown, firm, very carbonaceous, micropyrritic, micromicaceous and non calcareous.

The limestone is light grey to yellowish grey and pale yellowish brown. It is soft to firm, micritic and argillaceous.

Melke Formation 2055.0 – 2188.0 mMD, 2055.0 – 2188.0 mTVD
(2032.0 – 2165.0 mTVD MSL)

System: Jurassic

Series: Upper - Middle Jurassic

Stage: Middle Oxfordian – Upper Bajocian

Depositional environment: Marine, inner to mid shelf to inner shelf

The Melke Formation is picked at a slight decrease in gamma ray and resistivity log response, associated with an increase in sonic log velocity. The Melke Formation can be divided into two parts, an upper part consisting of claystone with thin limestone stringers, and a lower part comprising mainly sandstone and siltstone seen as three sequences of coarsening upwards on the gamma ray log.

The claystone is mainly dark greenish grey, but traces of olive grey is also seen. It is soft and sticky and slightly silty. It is occasionally both microcarbonaceous and micropyritic. The claystone is non to slightly calcareous throughout.

The limestone is yellowish white to light grey and olive grey, firm, slightly argillaceous, sandy and micritic.

Sand is seen in the upper part as loose quartz in trace amounts. The quartz grains are transparent to clear. The sand is very fine to fine and subangular to subrounded.

The sandy section of the Melke Formation (Melke Sandstone Member), from 2133 m MD to 2188 m MD, comprises sandstone with thin claystone beds grading into siltstone.

The sandstone is composed of clear, translucent and occasionally pale brown quartz grains. It is silty to fine grained, though predominantly very fine, moderately sorted and subangular. The sand is non calcareous, firm to friable, contains mica, pyrite and occasionally glauconite and has poor to fair visible porosity.

The claystone is dusky brown to dark brown, very sandy and silty grading into silty sandstones. It is fissile, very carbonaceous with occasional larger fragments of coaly material, micaceous with a slight trace of pyrite and non calcareous throughout.

The lower part of the Melke Formation, from approximately 2180 m MD consists of claystone with thin limestone and silty sandstone stringers.

The claystone is greenish grey to light greenish grey, firm to moderately hard. It is occasionally slightly glauconitic and pyritic and all over non calcareous.

The sandstone is brownish grey to olive grey, consisting of clear to translucent quartz often in a silty matrix. It is very fine to fine grained, subrounded to rounded and well sorted. It is soft to firm micaceous, glauconitic, occasionally pyritic and non calcareous throughout.

The limestone is as described above.

FANGST GROUP 2188.0 – 2222.0 mMD, 2188.0 – 2222.0 mTVD
(2165.0 – 2199.0 mTVD MSL)

The top of the Fangst Group is seen as an increase in the gamma ray readings along with a slight decrease in resistivity readings. The Fangst Group consists only of the Not Formation in this well.

Not Formation 2188.0 – 2222.0 mMD, 2188.0 – 2222.0 mTVD
(2165.0 – 2199.0 mTVD MSL)

System: Jurassic

Series: Middle Jurassic

Stage: Lower Bajocian – Middle Aalenian

Depositional environment: Marine shelf

The Not Formation consists of sandy siltstone interbedded with claystone stringers in the top of the formation followed by a silty sandstone member at the basal part. Thin stringers of limestone are seen both in the siltstone as well as the sand.

The siltstone and the sandstone is very much alike; they are both brownish grey, with clear to translucent quartz grains grading from silty to very fine through fine, to occasionally medium. The quartz grains are well sorted and subrounded to rounded. The sandstone /siltstone is soft to firm, non calcareous, micaceous, non to slightly glauconitic and occasionally carbonaceous.

The claystone is green grey to light green grey, firm to moderately hard and non calcareous.

BÅT GROUP 2222.0- 2400.0 mMD, 2222.0- 2400.0 mTVD
(2199.0 – 2377.0 mTVD MSL)

Based on bistratigraphical analyses the Båt Group is interpreted to be discordantly underlying the Fangst Group. The top of the Båt Group is defined by a more erratic gamma ray pattern and a decrease in resistivity readings. Apart from that, no major change is seen going from the Fangst Group above down into the Båt Group.

Tilje Formation 2222.0- 2228.0 mMD, 2222.0- 2228.0 mTVD
(2199.0 – 2205.0 mTVD MSL)

System: Jurassic

Series: Lower Jurassic

Stage: ?Upper Pliensbachian

Depositional environment: Marginal marine/fluviodeltaic

The Tilje Formation consists of a silty sandstone interbedded with claystone and limestone. The siltstone and the sandstone are brownish grey to olive grey, with clear to translucent quartz grains grading from silty to very fine through fine, to occasionally medium. The sand is well sorted, subround to round, soft to firm, non calcareous, micaceous, non to slightly glauconitic, occasionally carbonaceous and occasionally pyritic.

The claystone is green grey to light green grey, firm to moderately hard and non calcareous.

The limestone is yellow white to light grey, firm to moderate hard, platy to blocky and slightly argillaceous.

Åre Formation 2228.0- 2400.0 mMD, 2228.0- 2400.0 mTVD
(2205.0 – 2377.0 mTVD MSL)

System: Jurassic

Series: Lower Jurassic

Stage: Lower Pliensbachian – Sinemurian - ?Hettangian

Depositional environment: Fluviodeltaic/delta top

The top of the Åre Formation is defined by biostratigraphical analysis. The Åre Formation consists of a silty sandstone interbedded with claystone and limestone. In the upper part above 2347.5 m MD coal is only seen sporadically, while below coal is a constant member of the lithology.

The sandstone is similar to the silty sandstone described for the Ile Formation above, except for the occasional occurrence of medium grained quartz grains and a continuing occurrence of a white clayey matrix (kaolinite?).

The claystone is green grey to light greenish grey, firm to moderately hard, blocky to subfissile and non calcareous.

The limestone is yellow white to light grey, firm to moderately hard, occasionally soft, platy to blocky and slightly argillaceous. The coal below 2350 m is black, medium hard, brittle and shining. Trace amounts of pyrite and pyrite nodules are also seen throughout the formation.

TD: 2400.0 mMD, 2400 m TVD, (2377.0 mTVD MSL)

4.5 Hydrocarbon indications

All cuttings were returned to seabed while drilling down to 1311m MD. There were no indications of gas saturations from MWD logs or by monitoring the wellhead using short range sonar/visual CCD on the ROV.

No shows were reported from the Tertiary section. In the Cretaceous section shows were reported at 1816.5 m MD (side wall core) and 1819 m MD (cuttings) in the Springar Formation. Shows in the Springar Formation are only observed in slightly sandy claystones. The shows were described as patchy weak blue white fluorescence, very weak slow to diffuse blue cut fluorescence and a weak HC odor.

Cuttings shows from the core point in Melke sandstone at 2140 m MD were reported as weak direct yellow fluorescence with a weak HC odour. In cores from the Melke Sandstone Member, both direct as well as cut fluorescence have been reported. There is generally a strong HC odour in the sandy parts together with a brownish oil staining. The direct fluorescence is described as even blue white to yellow white. The cut is described as instant blue white cut fluorescence followed by a moderate streaming blue white cut.

There has only been reported a spotty pale yellow fluorescence in approximately 10 % of the cuttings from the Not, Tilje and Åre Formations decreasing to nothing in the Åre Formation at 2323 mMD.

The cut fluorescence is likewise described as weak. A very weak diffuse cloudy blue cut fluorescence is seen decreasing in the Åre Formation as for the direct fluorescence.

Side wall cores have also been studied for shows and likewise there are reported shows in the Jurassic sandstones. Shows diminishing in strength have been reported as far down into Åre Formation as 2270 mMD based on the side wall cores: weak HC odor, blue white direct fluorescence, slow streaming blue white cut, tapering into patchy pale yellow direct fluorescence, with a very weak diffuse blue cut fluorescence.

Shows in the Fangst and Båt Group is better in the side wall cores than in the cuttings, probably due to flushing of the sand in the cuttings samples.

Table 4.3 Gas peaks (FID)

DEPTH m RKB	GAS %	C ₁ ppm	C ₂ ppm	C ₃ ppm	iC ₄ ppm	nC ₄ ppm	C ₅ ppm	TYPE	BG %
1500	0.03	126	6	3				FG	0.03
2134	0.8	6057	463	238	26	48	(27)	FG	0.40
2140	0.26	2037	83	34	5	10	9	TG	0.03
2149	0.5	3034	298	127	16	34	24	FG	0.10
2164	0.5	3233	211	125	21	41	22	TG	0.05
2212	0.3	2042	154	62	6	13	30	FG	0.10
2369	0.2	655	39	15	3	7	16	FG	0.10

The gas levels were notably low during the entire 8 ½” hole section down to the coring point at 2140 mMD. Due to this the shaker box was modified in order to increase the mudflow past the gas sensor. The mud flow past the gas sensor increased, but the gas levels remained low when drilling from 2164 m MD to TD. However, the section drilled after the modification consists mainly of waterwet sandstones and was expected to give low gas levels.

4.6 Geophysical results

Refer to Figure 4.3.

The observed formation tops in the Tertiary and Cretaceous sections were encountered within the uncertainties of the prognosis. The Jurassic reservoir section tops were also encountered well within the uncertainties. The observed reservoir zonation within the Fangst Group and upper part of the Båt Group was according to prognosis, even though the seismic resolution limits the possibility to interpret which formations that are present.

4.7 Data acquisition

4.7.1 Cuttings and mud samples

A standard mud logging unit was used for the well (details in End of Well Report, Halliburton Sperry Sun).

- Cuttings were sampled every 10 m from 1320 mMD to 2020 mMD, and then every 3 m down to TD. Cuttings were also sampled every 3 m in the Springar Formation. Mud samples were sampled every 100 m from 1320 mMD to TD, and every 20 m in hydrocarbon zones (Figure 1.2).

4.7.2 Conventional coring

A total of 34 m was cored and 23.3 m was recovered (Fig. 4.4)

Table 4.4 Coring summary

Core no.	Cored interval (m)	Recovered			Barrel length	Date	Comments
		interval (m)	m	%			
1	2140 - 2164	2140 – 2163	23.0	95.8	27m	05-feb-03	Jammed
2	2164 - 2174	2164 – 2174	10.25	102.5	27m	07-feb-03	Jammed, core catcher broke

4.7.3 MWD/LWD

The MWD-logging was performed by Baker Hughes Inteq.

Table 4.5 MWD logging

Run no.	Depth interval mMD	Collar diam.	Tool type	Comments
1	460.5 - 1311	8 1/4"	MPR Lite	Good log quality
2	1311 - 2140	6 3/4"	MPR	Good log quality
3	2140 - 2400	6 3/4"	MPR	Good log quality

4.7.4 Wireline logging

Table 4.6 Wireline logging program

Wireline logging program			
#	TOOL COMBINATION	RUN	INTERVAL m MD RKB
1	PEX/ HALS/ HNGS	1A	1305 – 2385
2	ASI/ GR	1A	500 – 2382.5
3	DSI/ FMI/ GR	1A	592 – 2385
4	MDT/ GR (pressure points)	1A	1743,4 – 2346.3
5	MDT/ GR (sampling, mini-DST)	1B	2144 – 2169.5
6	CST/ GR	1A	1712 – 2370

Different log curves are shown in Figure 4.7 A and B.

When running CST there was two stops for 1 and 1,5 hour due to some technical problems. 60 shots where used, 47 had good recovery, 1 empty and 12 lost.

Bullet sticking and overpull up to 1800 lbs was experienced when pulling free the bullets.

Schlumberger performed a zero-offset VSP in the 6608/10-9 well. 68 levels were shot from 2382.5 to 500 mMD with a single level ASI tool.

4.7.5 *Data quality*

All objectives of the wireline logging operation were met and the quality of the log data and samples are generally good.

During ASI logging there was some problems with poor signal from ASI due to washouts. The data has been processed successfully onshore.

4.8 **Formation pressure**

The pore pressure profile shows a normal pore pressure gradient down to approximately 1400 mMD. Then the pressure increases and reaches a maximum pressure gradient of 1.26 g/cm³ at 1700 mMD. Below 1700 mMD the pore pressure decreases, reaching a normal gradient at 1.03 g/cm³, see Figure 4.5.

The formation pressure is calculated using several methods. Sonic, resistivity and Drilling-exponent seems to give too high calculated values. Although a PDC bit was used, the D-exponent seems to give the best estimate of the formation pressure.

The overburden gradient is calculated using the density log from 1300 m MD and down to TD. Above the 13 3/8" casing shoe, data from 6506/12-1, 6608/11-2 and 6608/10-1 were used.

Pore pressure gradient in top Melke Sandstone member was calculated to be 1.07 g/cm³ from MDT measurements. A small decline down to bottom of the Melke Sandstone member to 1.06 g/cm³ was observed.

Using linear regression a fluid gradient of 0.075 bar/m (0.762 g/cm³ was calculated in the top Melke Sandstone). A fluid gradient at bottom Melke Sandstone member was calculated to 0.070 bar/m (0.715 g/cm³), see Figure 4.6.

These gradients indicates lighter fluids than the measured density at reservoir conditions from the PVT analysis. The density was measured to 0.774 g/cm³ at both 2152,5 and 2169,5 mMD. However, there may be small changes in the pressure regimes in the Melke Sandstone member and fluid gradients calculated on the basis of the pressure measurements are uncertain.

The pore pressure gradient decreases towards the Not and Åre Formation, and in the top of Åre, the pore pressure gradient is 1.036 g/cm³. The Åre water zone has a gradient of 1.01

g/cm³ based on water analysis. Linear regression in the Åre Formation gave a straight line, and confirmed a fluid gradient of 0.099 bar/m (1.01 g/cm³).

Figure 4.5 shows the estimated pressure profile for the well and Figure 4.6 shows the MDT pressure point in the Reservoir Formation.

4.8.1 *Reservoir pressure summary*

In the first MDT run a total of 27 pre-tests were taken. Twenty-three good tests, two were tight, one was supercharged and one was unstable.

Three mini DST were performed and three pretests were taken, see Table. 4.8. Oil samples at 2169.5 and 2152.5 mMD were collected using a dual packer, three 450 cc bottles and one 1-gallon bottle were filled.

A standard quartz gauge was used in the two first mini DST, but the third mini DST at 2144.5 m MD was performed with a strain gauge due to technical failure in the quartz gauge.

Pressure measurements shows good defined gradients in the Melke Formation oil zone and in the Åre Formation water zone.

As a general observation there is a pressure reduction between The Melke and Not Formation, see Figure 4.5.

Table 4.7 MDT pretests, Run 1A

Test no	Depth (m MDRT)	Depth (m TVDRT)	Depth (mMSL)	Hydro pressure Before (Bar)	Hydro pressure After (Bar)	Formation pressure (Bar)	Mobility (mD/cp)	Temp (°C)	Comments
1	2134.2	2111.2	2087.2	284.92	284.90	223.74	22.9	65.0	Good test
2	2136.3	2113.3	2089.3	285.20	285.18	223.90	23.5	65.0	Good test
3	2138.2	2115.2	2091.2	285.40	285.39	224.11	7.0	65.2	8 cc
4	2141.3	2118.3	2094.3	285.80	285.77	224.32	4.8	65.5	Good test
5	2144.4	2121.4	2097.4	286.19	286.16	224.46	5.6	65.8	Good test
6	2150.5	2127.5	2103.5	286.97	286.97	225.02	4.2	66.1	Good Test
7	2152.0	2129.0	2105	287.19	287.18	225.06	35.0	66.4	Good test
8	2156.1	2133.1	2109.1	287.67	287.69	225.39	5.4	66.9	Good test
9	2167.5	2144.5	2120.5	289.16	289.21	226.07	73.8	67.4	Good test
10	2168.5	2145.5	2121.5	289.37	289.28	226.15	18.4	68.0	Good test
11	2169.8	2146.8	2122.8	289.50	289.53	226.23	84.3	68.4	Good test
12	2172.3	2149.3	2125.3	289.81	289.82	226.52	6.0	69.1	Good test. slightly unstable
13	2207.3	2184.3	2160.3	294.46	294.47	227.34	1.1	71.4	Low perm. Supercharged
14	2210.0	2187.0	2163	294.75	294.80	224.91	-	71.9	Good test
15	2215.5	2192.5	2168.5	295.56	295.48	225.41	34.9	71.9	Good test
16	2222.4	2199.4	2175.4	296.41	296.40	225.91	139.6	72.3	Good test
17	2229.4	2206.4	2182.4	297.33	-	-	-	73.0	Plugged/Unstable
18	2229.8	2206.8	2182.8	297.40	297.47	226.70	161.0	73.1	Good test
19	2241.5	2218.5	2194.5	298.85	298.96	227.75	3 538.4	73.5	Good test
20	2255.5	2232.5	2208.5	300.82	300.87	229.12	3 386.9	73.8	Good test
21	2268.7	2245.7	2221.7	302.51	302.55	230.44	274.6	74.3	Good test
22	2283.5	2260.5	2236.5	304.46	304.48	231.92	374.0	74.9	Good test
23	2306.0	2283.0	2259	307.51	307.46	234.17	391.6	75.5	Good test
24	2319.5	2295.3	2271.3	309.30	309.30	235.52	4 334.2	76.1	Good test
25	2346.3	2322.0	2298	312.87	312.91	238.21	907.9	76.8	Good test
26	1815.8	1792.6	1768.6	242.80	-	-	-	56.5	Tight
27	1743.4	1731.0	1707	234.65	234.67	-	-	54.2	Tight

Table 4.8 MDT pretests, Run 1B

Test #	Fm name	Depth (mTVD RKB)	Depth (mTVD MSL)	Form. Pressure (Bar)	Hydrost. Pressure Before (Bar)	Hydrost. Pressure After (Bar)	Mobility (mD/cP)	Temp (°C)	Comments
1	Melke	2167.5	2146.5	225.98	289.10	289.10	57.5	67.1	Mini DST. samples
2	Melke	2150.5	2129.5	224.81	286.76	286.69	6.7	71.3	Mini DST. samples
3	Melke	2142.0	2121.0	224.17	285.34	285.43	4.8	72.4	Mini DST

4.9 Reservoir fluid sampling

Oil samples were collected in the Melke Formation using a dual packer. Even though some technical problems occurred during sampling with the MDT tool, the samples were of good quality.

Table 4.9 Samples collected

Sample Depth (mMD RKB)	Formation	Bottle no. /Serial	Petrotech bottle no.	Chamber volume	Dradown (Bar)	Sample Type	Volume (cc)	Dead volume (cc)
2169.5	Melke	MPSR-3 (754)	TS-6007	450 cc	3.8	Oil	-	7.2
2169.5	Melke	MPSR-2 (719)	TS-2315	450 cc	3.8	Oil	400	10.2
2169.5	Melke	MPSR-6 (931)	PT-2008	450 cc	3.8	Oil	420	10.3
2169.5	Melke	SC_1 (151)	PT-4019	1 gal	3.8	Oil	3630	-
2152.5	Melke	MPSR-1 (695)	PT-1123	450 cc	10	Oil	400	11.1
2152.5	Melke	MRSR-5 (852)	PT-1166	450 cc	10	Oil	420	12.0
2152.5	Melke	MPSR-4 (788)	TS-5319	450 cc	10	Oil	390	12.5
2152.5	Melke	SC_2 (153)	TS-47302	1 gal	6	Oil	3540	-

4.10 Leak off test

An extended LOT (XLOT) was performed under the 13 3/8" casing shoe. The breakdown pressure was measured to 1.72 g/cm³, the first cycle in the XLOT to 1.57 g/cm³, and the closing pressure to 1.48 g/cm³.

The XLOT showed that an existing fracture was reopened at a pressure of 1.56 g/cm³. Which is similar to the propagation pressure in the second cycle.

The XLOT value is plotted in Figure 4.5.

4.11 Formation temperature

An average temperature gradient of 4.2 °C/100 meters is calculated from the seabed down to TD, based on the log temperatures. This gradient gives a temperature of 88.2 °C at TD.

The evaluated temperature is calculated by using an in-house (Hermansrud, 1999) equation that take into consideration the time since circulation and the measured temperature from the logging tool.

Temperature measurements are available from all the logging runs.

See Figure 4.8 for temperature profile.

Table 4.10 Measured and evaluated temperatures

Tool combination	Depth of measurement m TVD RT	Recorded max temperature °C	Time since last circulation hrs	Evaluated temperature °C
PEX/ HALS/ HNGS	2370,5	72	14	94.0
ASI/ GR	2382,5	75	27.5	86.7
DSI/ FMI/ GR	2371,0	70	30,7	93.0
MDT/ GR (pressure points)	2346,5	80	41.6	87.7
MDT/ GR (sampling, mini-DST)	2169,5	69	11.8	91.3
CST/ GR	2370,0	74	21.8	88.4

4.12 Experiences / recommendations

The wireline operation in this well went according to plan.
 The recommendation is to focus on logistic in both the planning and operational phase.

The choice of coring equipment was based on experience from 6608/10-6 and 6608/10-7. Two cores were cut in the Melke Formation. Core #2 jammed after 10 m because the core catcher broke, and prevented the core from entering the barrel. However, the main part of the reservoir was cored, and it was decided to continue drilling. The result of the coring was good, despite the jamming of core#2. In order to optimize the coring performance the use of oil based mud can be an important factor when coring in formations with interbedded sand and shale.

PL 128

RKB - MSL: 23 m

Water Depth: 377 m MSL

Stratigraphy Well 6608/10-9



Made by: TAWJ

Date: 26.05.2003

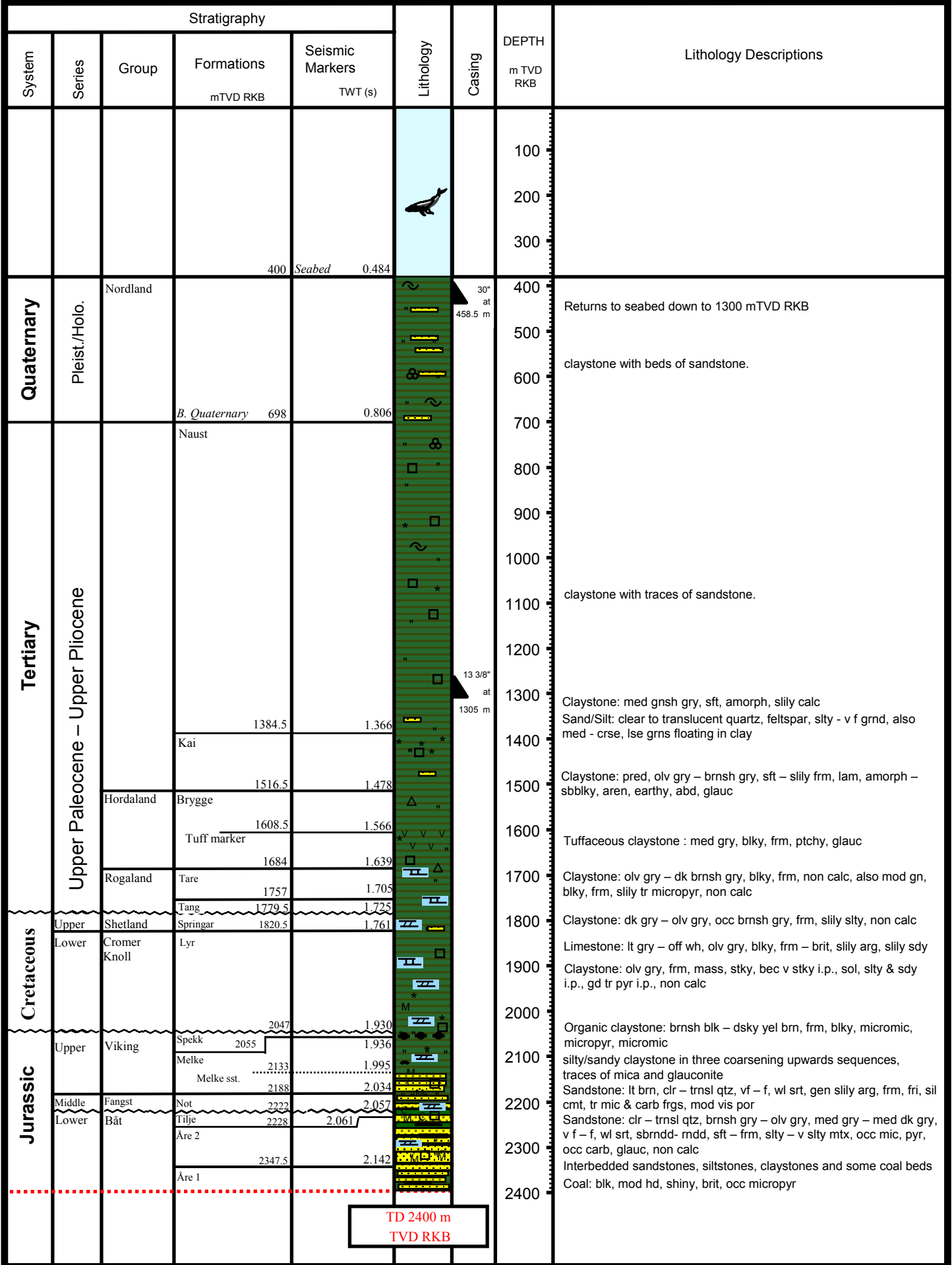


Fig. 4.1

PL 128

RKB - MSL: 23 m

Water Depth: 377 m MSL

Reservoir section Well 6608/10-9



Made by: TAWJ

Date: 26.05.2003

Stratigraphy					Lithology	Coring	Shows	DEPTH m TVD RKB	Lithology Descriptions
System	Series	Group	Formations mTVD RKB	Seismic Markers TWT (s)					
Jurassic	Upper	Viking	Melke				2100	Claystone: dk gnsh gry, sft, stky, amorph, slily stly, micromic, micropyr, microcarb, non - slilly calc Limestone: lt gry - off wh, olv gry, blk, frm - brit, dom mic, slily arg, slily sdy	
			Melke sst.	2133	1.995		2150	Silty/sandy claystone in three sequences coarsening upwards, traces of mica and glauconite Sandstone: lt brn, clr - trnsl qtz, vf - f, wl srt, gen slily arg, frm, fri, sil cmt, tr mic & carb frgs, mod vis por SHOWS: even wk - mod wh - yel wh dir fluor, fast - mod str bl - bl wh cut fluor	
		Fangst	Not	2188	2.034		2200	Claystone: gryish gn - dsky yelsh brn, also olv gry and occ brnsh gry, frm - mod hd, blk - sbply, non calc - occ slily calc Siltstone/Sandstone: clr - trnsl qtz, brnsh gry - olv gry, med gry - med dk gry, v f - f, wl srt, sbrndd- rddd, sft - frm, stly - v stly mtx, occ mic, pyr, occ carb, glauc, non calc	
Jurassic	Middle	Båt	Tilje	2222	2.057		2250	Siltstone/Sandstone: brn gry - olv gry, clr - trnsl qtz, v f - f, occ med, sbrnd - rnd, wl srt, sft - frm, stly - v stly, also wh arg mtx (kao?), mic, occ pyr, occ carb, glauc, non calc Claystone: gn grey - lt gn gry, frm - mod hd, blk - sbply, non calc Limestone: yel wh - lt gry, frm - mod hd, pty - blk, slily arg SHOWS: wk HC odour, spotty pl yel fluor, (less than 10 %), v wk diffuse cloudy bl cut fluor	
			Åre 2	2228	2.061		2300	Siltstone/Sandstone: occ med grnd qtz, else a.a	
	Lower		Intra Åre1 shale/coal	2347.5	2.142		2350	Interbedded sandstones, siltstones and claystones with coal beds Siltstone/Sandstone: clr - trnsl qtz, brnsh gry - olv gry, med gry - med dk gry, v f - f, wl srt, sbrndd- rddd, sft - frm, stly - v stly mtx, occ mic, pyr, occ carb, glauc, non calc Claystone: dk gry - lt gry, stly, sft - frm, slily calc Limestone: yel wh - lt gry, frm - sft, sbblk - blk, slily arg, dolomitic Coal: blk, mod hd, shiny, brit, occ micropyr	
						2400			

Fig. 4.2

PL 128

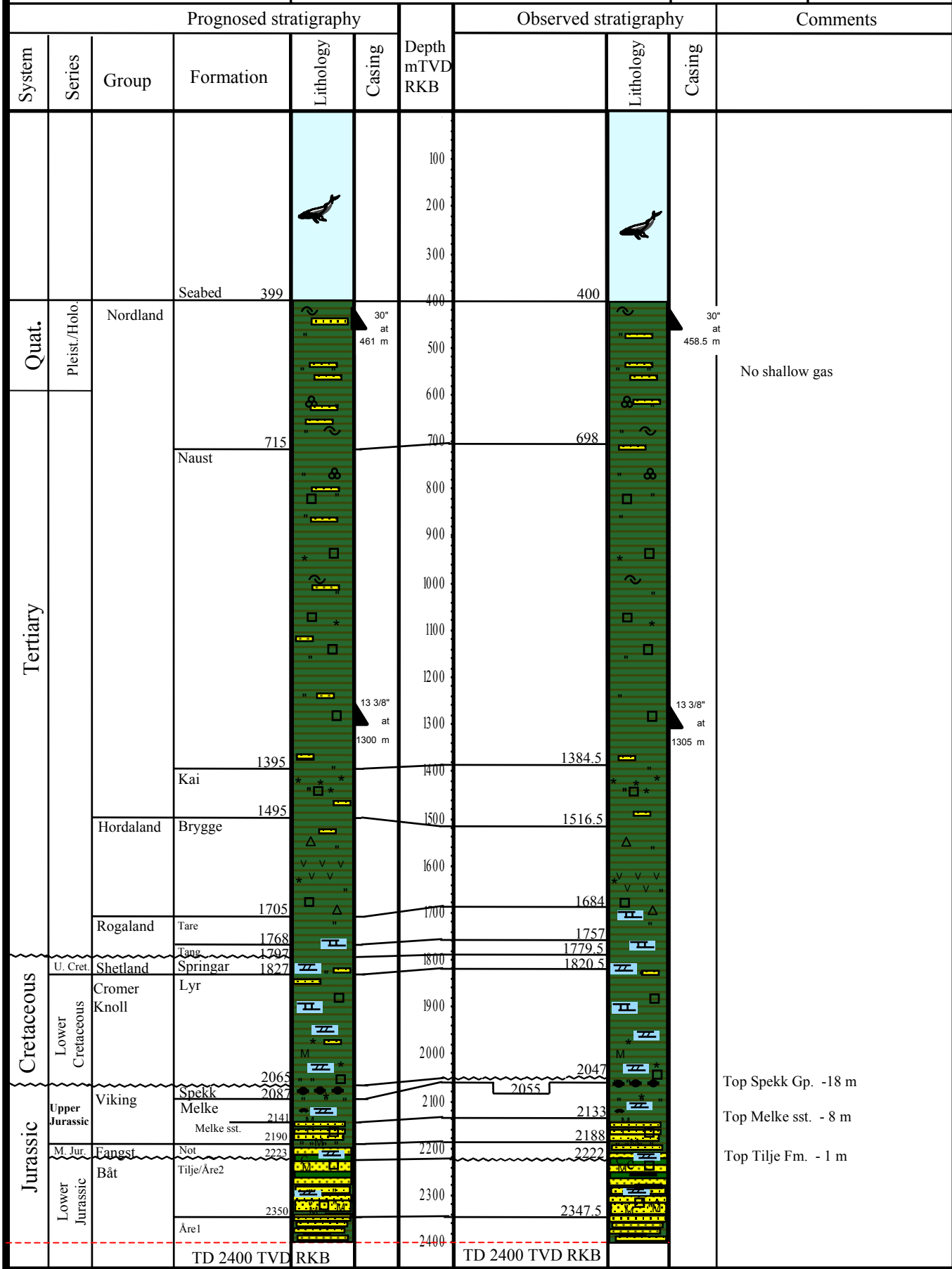
RKB – MSL: 23 m

Water depth: 377 m MSL

Well 6608/10-9
Prognosis vs. observed stratigraphy



Made by: TAWJ Date: 26.05.03



No shallow gas

Top Spekk Gp. -18 m
Top Melke sst. - 8 m
Top Tilje Fm. - 1 m

Fig. 4.3

6608/10-9, Coring summary, Melke Fm.

Core No.	Top of cored interval (mMD)	Bottom of cored interval (mMD)	Core recovery (m)	Core recovery (%)	ROP m/hr	Attempted core length	Utilization (%)
1	2 140.0	2 164.0	23.00	95.8	6.5	27	85.2
2	2 164.0	2 174.0	10.25	102.5	5.6	27	38.0

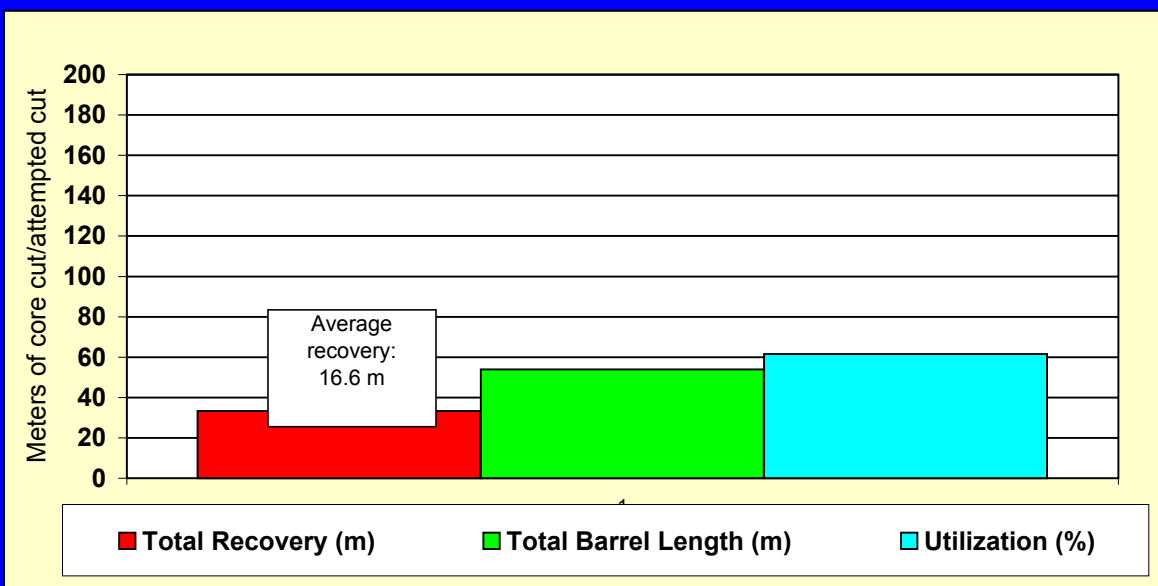
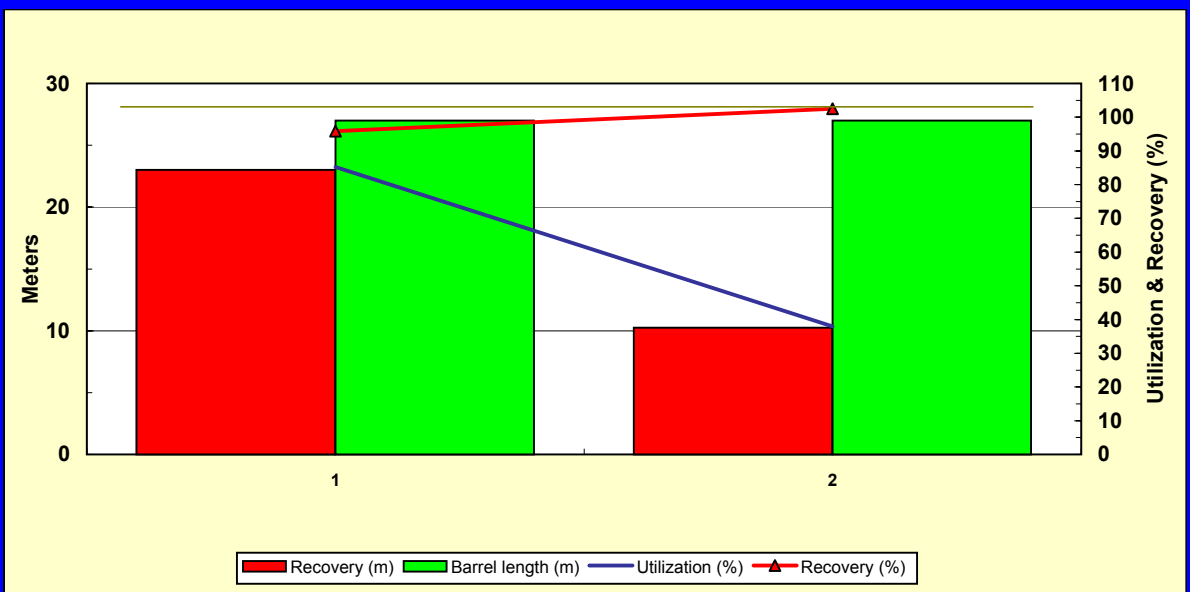


Fig. 4.4

PL 128

RKB - MSL: 23 m

Water Depth: 377 m MSL

Pressure Plot Well 6608/10-9



Made by: SVTY

Date: 26.05.03

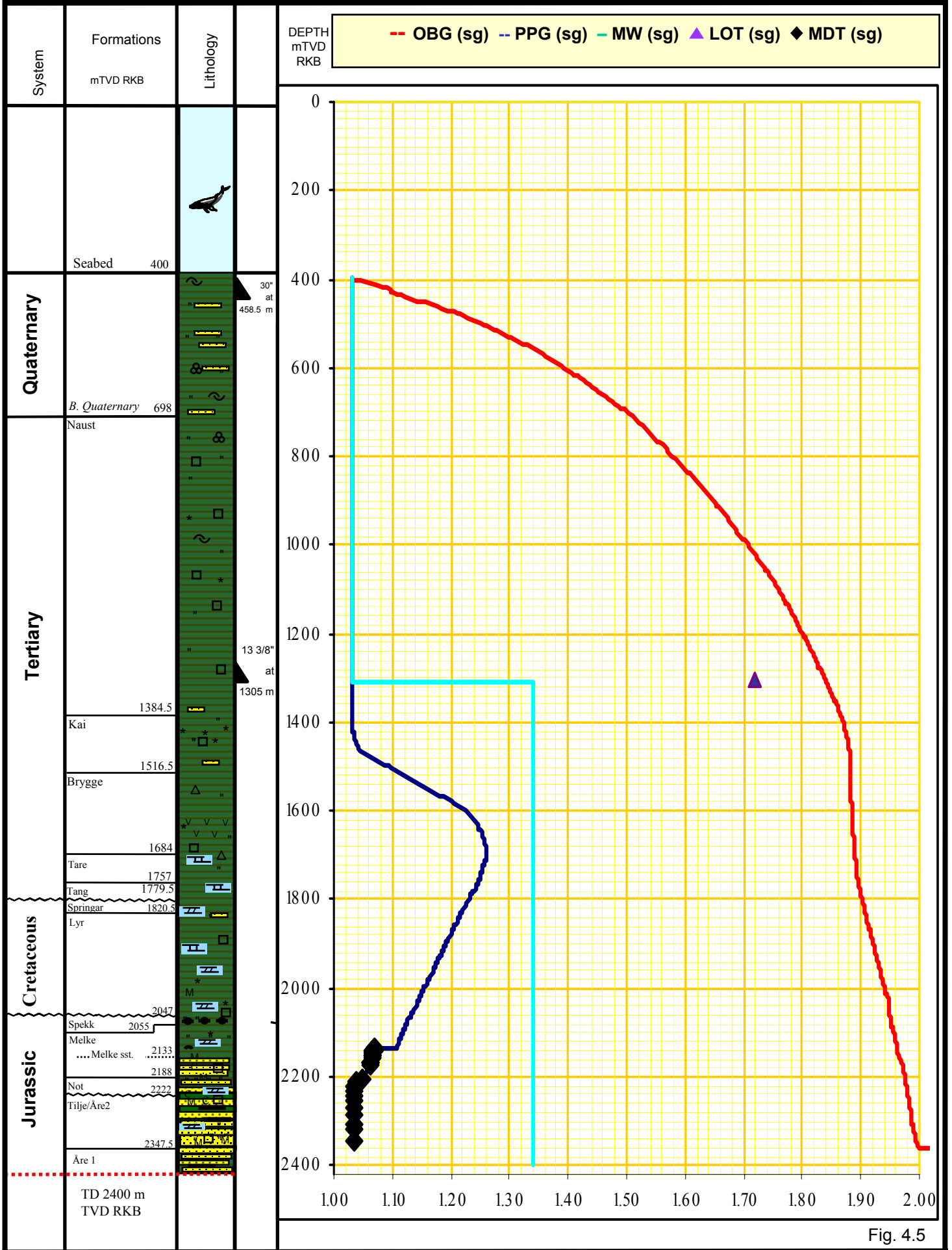


Fig. 4.5

PL 128

MDT Pressure Plot 6608/10-9



RKB - Sea: 23 m

Water Depth: 377 m MSL

Made by: SVTY

Date: 12.05.03

◆ Top Melke sst. • Bottom Melke sst. ■ Not ▲ Tilje/Åre 2 ● Åre 1

Depth
mTVD
RKB

Pressure [bar]

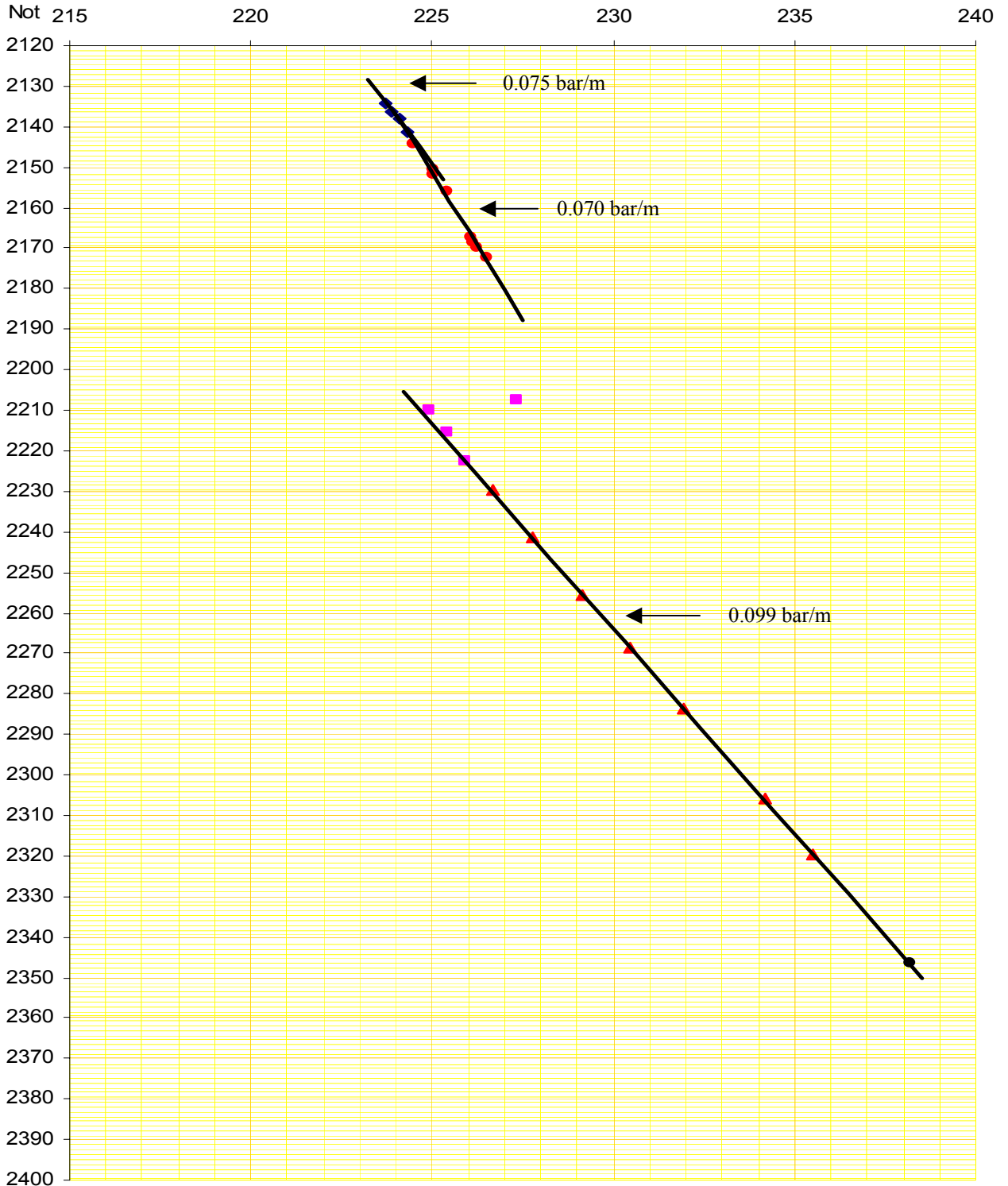


Figure 4.6

PL 128

RKB - Sea 23 m

Water depth 377 m MSL

Composite plot Well 6608/10-9



Made by: Svty

Date: 27.05.2003

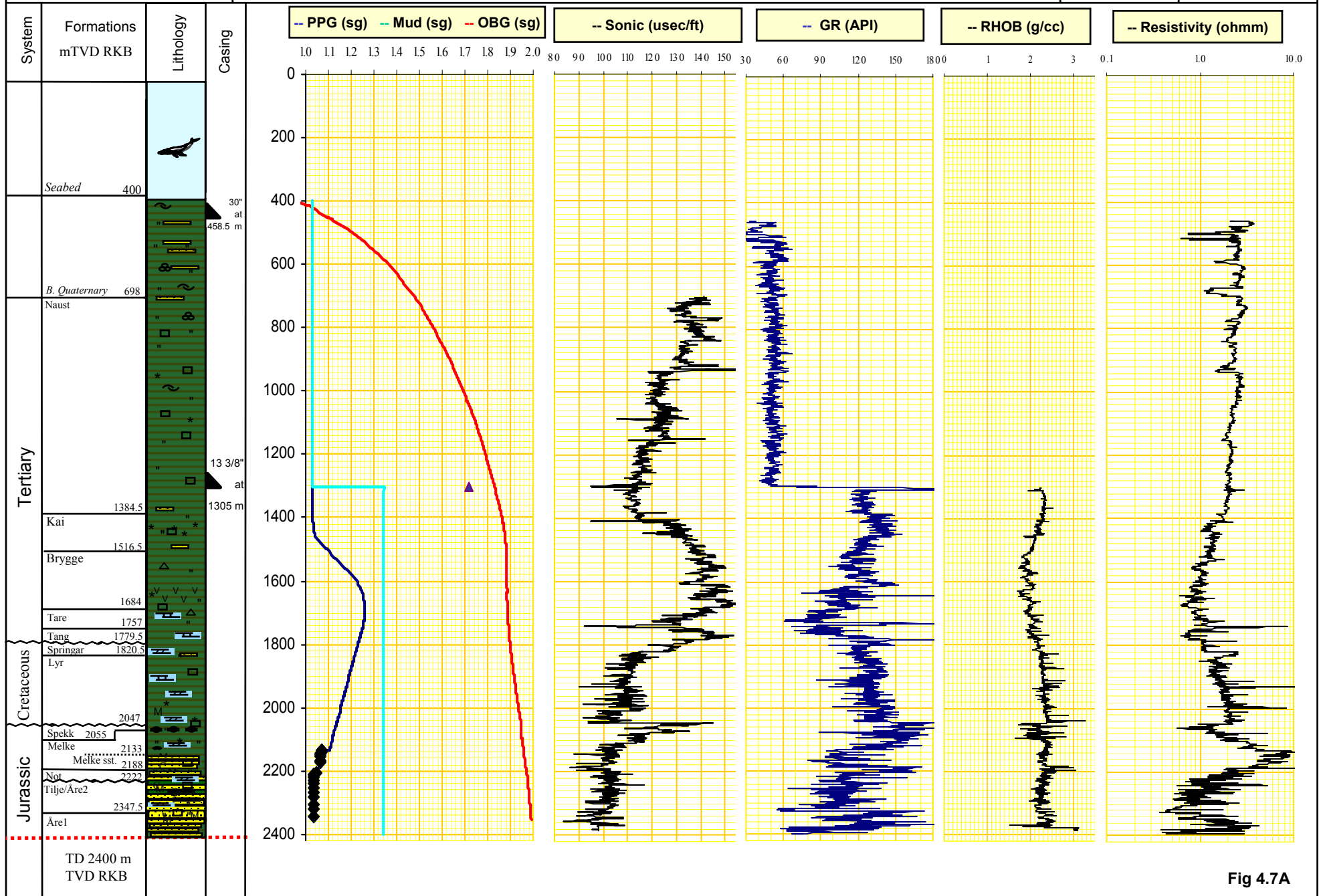


Fig 4.7A

PL 128

RKB - Sea 23 m

Water depth 377 m MSL

Composite plot Well 6608/10-9



Made by: Svty

Date: 27.05.2003

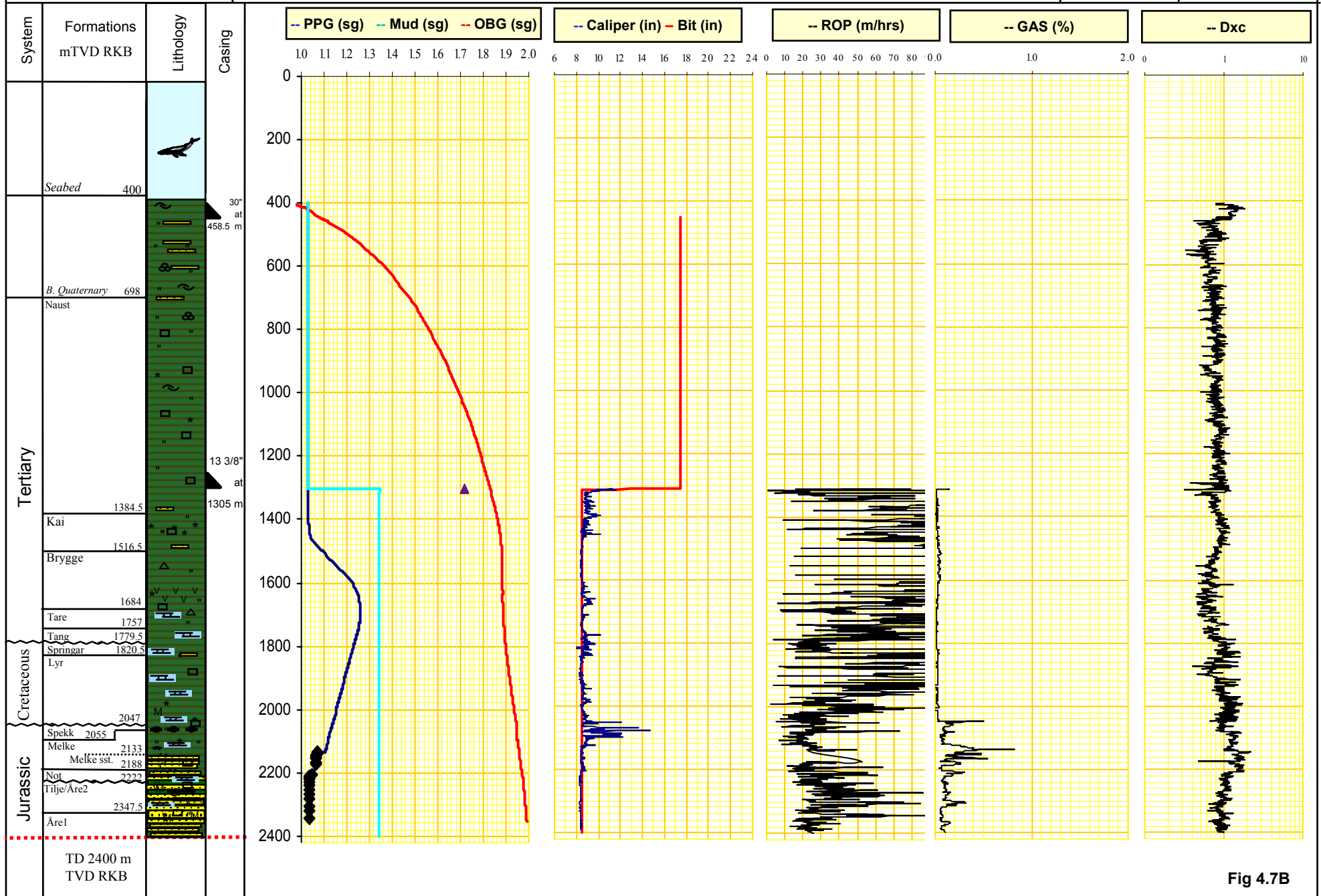


Fig 4.7B

PL 128

RKB - MSL: 23 m

Water Depth: 377 m MSL

Temperature Prognosis Well 6608/10-9



Made by: SVTY

Date: 26.05.03

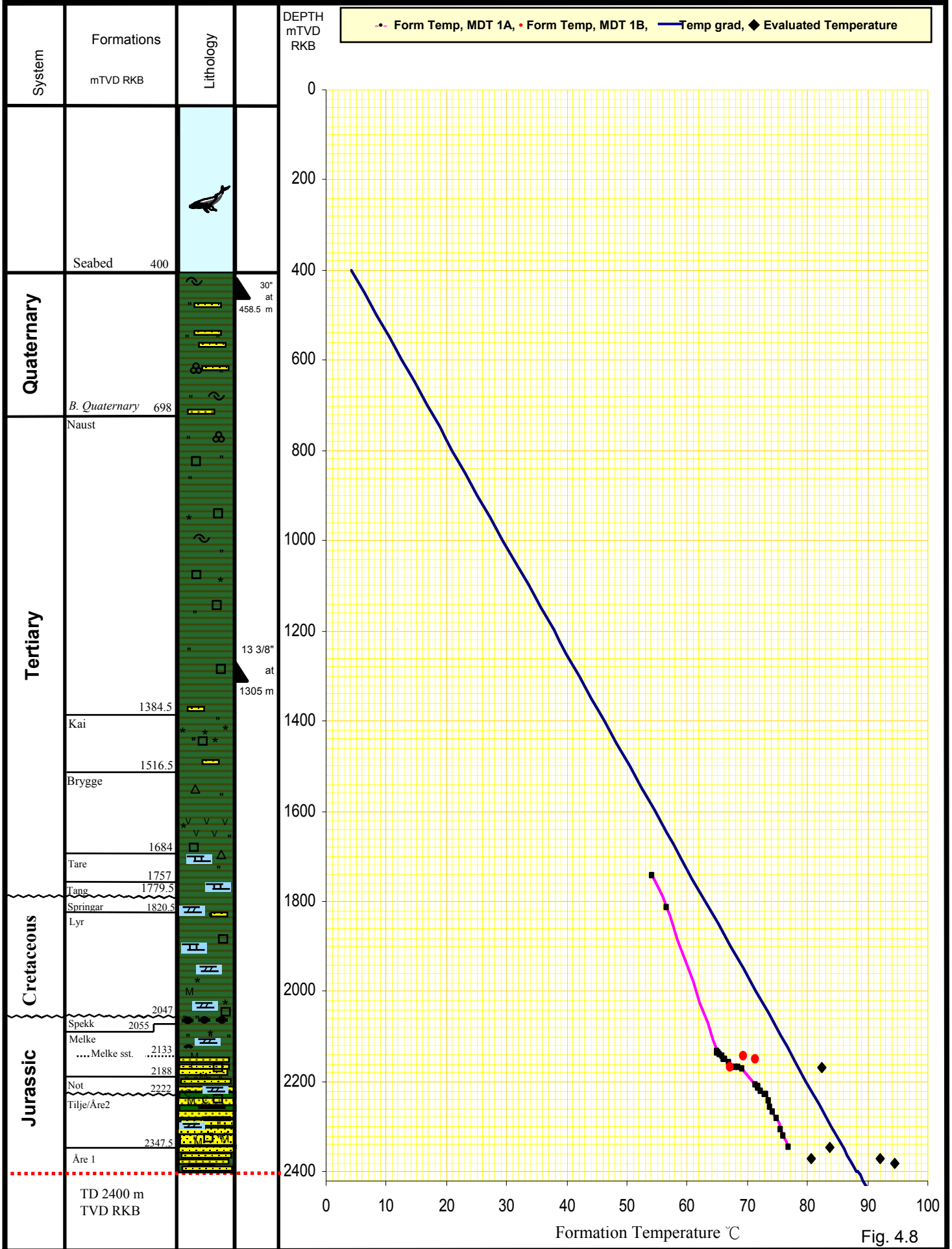


Fig. 4.8

5 Drilling operations report

5.1 Rig move and positioning

5.1.1 Summary

The semi-submersible rig "Deepsea Bergen" was moved from block 16/7 to the Lerke location 6608/10-9. The transit distance, 507 Nm, was done in 73 hrs with an average speed of 7.0 knots. Skandi Bergen and Olympic Poseidon were used as towing wessels, towing on two anchor chains.

During transit service and maintenance on rig equipment were carried out. Due to this, any preparation for spudding was not carried out during transit.

Anchor handling of 8 anchors, ballasting of rig and tension testing of anchors to 180 tons/15 min were performed in 14 hrs.

5.1.2 Experiences / recommendations

Towing:

Using two towing wessels proved beneficial, resulting in a relatively short transit time. It is recommended to use this method when moving rigs over great distances.

5.2 Drilling top hole section

5.2.1 Summary

After placing out transponders and marker buoys, a 36" hole was drilled from sea bed at 400 m to section TD at 460.5 m. Used low weight on bit to ensure vertical hole and average ROP was 1.8 m/hr. The top hole section was drilled using sea water and high viscosity pills as drilling fluid. Drilled to 416.5 m, where the BHA had to be pulled out due to harsh weather. Had to wait on weather for 25 hrs before drilling could be resumed. The hole was reentered, despite poor visibility and drilled to TD. Boulders were encountered while reaming the section at TD. The Anderdrift inclination surveys varied between 1.75° in the very top of the hole to 1.0° at TD. The singleshot dropped at TD prior to pulling out showed 0.25° inclination. At TD the hole was displaced to 1,35 g/cm³ mud prior to pulling out. No overpull was experienced when pulling out of hole.

The 30" conductor was run to 458.5 m and cemented in place with 30" WH 2.9 meter stick up and an angle of 0.5°. The conductor was washed down the last meters and landed on bottom

of 26" hole opener TD. The Cement slurry used for the conductor was 1.56 SG X-Lite slurry, and 300% OH excess was used.

5.2.2 *Experiences / recommendations*

- Drilling parameters:
The top hole was drilled with maximum flow (4700 lpm), high rotational speed (100 - 130 rpm) and low WOB (0-3 mT). This has proved to be the best way to ensure a vertical top hole in his area. Experience shows that patience and acceptance of low ROP are necessary to keep the hole inclination within the limit when drilling through boulders.
- X-Lite cement slurry:
Proved to be successful as this allowed the conductor running tool to be pulled free of the conductor immediately after pumping and displacing the cement, thus saving rig time spent on WOC.
- Cement excess:
Used 300% excess lead cement based on open hole volume and 15 m³ tail cement, and this is recommended for future X-Lite cement jobs. Returns were detected by ROV.
- Cementing:
Observed gas bubbles emerging from cement return ports in 30" conductor. This, however, is a normal experience in the area.
- Bottom Hole Assembly:
Used a Red Baron Heavy Duty two stage hole 26"/36" opener with a 17 1/2" milled tooth bit, together with a 9 1/2" Anderdrift and 8" drill collars. This BHA should provide the necessary stiffness to drill top holes in this area.
- Anderdrift:
Problems getting Anderdrift surveys due to rig not properly positioned above the hole.

5.3 **Drilling 17 1/2" section**

5.3.1 *Summary*

A 17 1/2" section was drilled out of the 30" conductor and down to TD at 1311 m in one bit run. A pendulum assembly with a milled tooth bit; IADC-code 115, was used. Drilling out the 30" conductor shoe and cleaning the rat hole took 4.5 hours, and the rest of the section was drilled with an average on bottom ROP of 53.8 m/hr. As boulders were prognosed down to 597 m, the WOB was restricted in this interval. Seawater and high viscosity pills were used as drilling fluid in this section. At TD the hole was circulated clean and displaced to 1.30 g/cm³ mud. Some minor tightspots (10-20 mT) were experienced while pulling out of hole.

The 13 3/8" casing was run and set at 1305 m with an average running speed of 4-5 joints per hour. Had to circulate the casing past restriction at 1281 m. The casing was successfully cemented. Had full returns during cement job and bumped the cement plugs with 97% pump efficiency. A single plug system was utilized, and a "shark bite" was installed above the landing collar to ease drilling out the plug.

Ran and installed the riser and BOP and pressure tested the well to 180 bar/15 min.

5.3.2 *Experiences / recommendations*

- Drilling parameters:
The section was drilled with 4500 lpm / 100-160 rpm / 3-19 mT WOB.
The pendulum bottom hole assembly with a 17 1/2" Huhges Christensen MXT1 milled tooth bit worked well. The entire section was vertical. No stick-slip/vibrations was identified within a wide span of RPM and WOB. The average on bottom ROP was 53.8 m/hr.
- Running casing / winter condition:
The 13 3/8" casing arrived the rig with storage dope on the threads. Cleaning off this dope and re-doping the casing with running dope proved to be most difficult in the sub zero weather conditions as water froze on the threads during cleaning. It is recommended to ship out the casing ready doped with running dope.

5.4 Drilling 8 1/2" section

5.4.1 Summary

The 8 1/2" section was drilled from the 13 3/8" casing shoe at 1305 m and down to TD at 2400 m. In the Melke reservoir two cores were cut and recovered. The reservoir was successfully logged before it was plugged back.

The section was drilled using a packed rotary assembly and a 5 bladed steel body PDC bit. The drilling fluid used was 1.34 g/cm³ low-sulphate 99% KCl/glycol/polymer water based mud. The low sulphate drilling fluid was used to make high quality formation water samples feasible. The 13 3/8" casing shoe and rat hole was drilled out and cleaned using this assembly, and the plug and shoetrack was drilled out in 3 hours. Below the 13 3/8" casing a shoe, an extended leak was carried out. Final leak off pressure was 1.72 g/cm³ EMW, and the re-opening pressure was found to be 1.54 g/cm³ EMW.

The section down to coring point at 2140 m was drilled with a Security DBS FS2565E, with an average ROP of 39.1 m/hr. The rate of penetration was in the region 50-100 m/hr down to the Springar Formation, in which the penetration rate was restricted to 20 m/hr. Below the Springar Formation the ROP tailed off, even though no restrictions were laid upon the ROP. When pulling out for coring, the hole was swabbed as a result of the stabilisers being packed with sticky clay. Hence was the bit run back to bottom and backreamed out to the 13 3/8" casing shoe. The bit, however, came out clean of clay and with the following dull grade 5-3-RO-S-X-1-LT-CP. The bit lost 14 cutters.

Two cores were cut; core number one was cut from 2140 m to 2164 m, where it jammed off. The second core was cut from 2164 m to 2174 m, where this core jammed off as well.

The remaining part of the well was drilled with the same packed assembly as mentioned above, and with a new Security DBS FS2565E. The penetration rate was hampered due to rig heave and average on bottom ROP was 26.9 m/hr.

Six wireline logging runs were carried out without operational problems, including MDT sampling in the Melke reservoir and sidewall cores. Refers to Chapter 4.7.4 for additional information regarding logging. There were no tendencies of sticky conditions during the wire line logging.

5.4.2 Experiences / recommendations

- Drilling out of 13 3/8" casing shoe:
Drilled out of the 13 3/8" casing shoe with the 8 1/2" drilling assembly in 3 hours. There

were no problems associated with this.

- Extended Leak Off Test:
Prior to performing the extended leak off, a “conventional” leak off was performed. In the planning phase a minimum necessary LOT value was set, and the “conventional” LOT had to meet this value in order to continue carrying out the extended LOT. The reason for this was to avoid problems with the casing design as the XLOT reduces the available formation strength.
- Drilling parameters:
The section was drilled with 2500 - 2600 lpm / 80-160 rpm / 2-10 mT WOB. A packed bottom hole assembly with an 8 ½” Security DBS FS2565E was used. The average on bottom ROP was 39.1 m/hr above the cored section and 26.9 m/hr below. Severe stick slip was measured between 1720 – 1790 m.
- Bit balling:
There was not experienced any signs of bit balling, even though the BHA stabilizers were found to be heavily balled up. This is believed to be mainly caused by the design of the 5-bladed steel body PDC bit and the high HSI values obtained (in the region between 7 to 8).
- Mud parameters:
The water based KCl/polymer/glycol drilling fluid was at first run with glycol content around 3.5% and a KCl content of 120 – 130 kg/m³. This proved to be insufficient to avoid problems with sticky clay down hole. Towards the end of the section the glycol content was increased to 4% and the KCl content to approximately 140 kg/cm³.

It is recommended to maintain the glycol content at 5% and keep the KCl levels in the region between 140 to 160 kg/cm³ for future wells in this area.
- ECD measurements:
The ECD measurements were found to be erroneous as a result of the stabilizers being packed up with sticky clay. This became evident as the ECD measurements followed the same variations as the stand pipe pressure.

5.5 Temporary P&A

5.5.1 Summary

Ran in hole with cement stinger (muleshoe, 248 m of 3 ½” DP and 5 ½” DP to surface), and placed two gas tight cement plugs from 2400 m to 1910 m. A third non-gastight cement plug was placed upon a Perigon cement support tool from 1450 to 1200 m, thereby covering the transition between open hole and casing. This cement plug was tested to 122 bar (70 bar

above the 1.72 g/cm³ EMW leak off at the 13 3/8" casing shoe). A 13 3/8" EZSV plug was placed at 655 m and tested to 139 bar. The volume above the plug was displaced to sea water and the wear bushing was pulled.

Harsh weather conditions postponed further operation with 2.2 days. The BOP was pulled, the guide posts removed and a trawl deflection frame was placed over the well head.

The anchors were pulled and the rig was off contract at 20.02.2003.

NOTE: On the 30" conductor wellhead a canvas sleeve is installed to reduce the necessary over pull needed when carrying out the permanent P&A operation.

NOTE: The EZSV placed in the 13 3/8" casing is dressed as a bridge plug, with the bottom sleeve left open.

5.5.2 *Experiences / recommendations*

Perigon Cement support tool:

The perigon cement support tool was pumped out of the string before cement was pumped, to avoid cementing up the cement stinger if the Perigon tool gets stuck in the pipe.

5.6 Figures and tables

5.6.1 *Well schematic*

Well: **6608/10-9**
 Field: **Lerke**
 Rig: **Deepsea Bergen**

WELL SCHEMATIC

All depths referes to RKB
 RKB - MSL Deepsea Bergen: 23 m

HOLE		CASING				LOT FIT	TOC		CSG. SHOE		RKB	LWD LOGS	WL LOGS	SURV CSG/ OH
SIZE	TVD MD	SIZE	TYPE / RAD. MARKERS	CENTRALIZERS	TEST PRESS [BAR]		TVD	MD	TVD	MD				
Sea Bed	400.0						400.0	400.0						
36"	460,5 460,5	30"	5 jnts. 30", 309.7 lb/ft, X-52, ST-2. incl 30" WH housing & shoe joint	None	N/A		Seabed	Seabed	458,5	458,5		None	None	<u>OH</u> : DIR
17 1/2"	1 311 1 311	13 3/8"	18 3/4" WH hanger incl. extension jnt. x-over to 13 3/8" 72 lb/ft, P-110, New Vam	Type: NW-ST A4 1 centr./jnt on bottom 5 jnts	180	LOT	Seabed	Seabed	1 305	1 305		Ref. fig. 5.1 in chap. 5	None	<u>OH</u> : DIR
8 1/2"	2 400 2 400	NA	No liner to be installed									Ref. fig. 5.1 in chap. 5	Ref. fig. 5.1 in chap. 5	<u>OH</u> : DIR



5.6.2 *P&A wellbore schematic*

Well: 6608/10-9
 Field: Lerke
 Rig: Deepsea Bergen

WELL SCHEMATIC - PLUGGED WELL

Purpose of plugging: Temporary P&A
 Date of abandonment: Februar, 2003

HOLE		CASING and FORMATION				LOT / FIT	TOC		CSG. and PLUGS		RT	TESTS	CUT
SIZE	TVD MD	SIZE	CASING TYPE	PERMEABLE HC BEARING ZONES	Mud [g/cm ³]	s.g.	TVD	MD	TVD	MD			
Sea Bed	400										Slim hole seat protector retrieved		
36"	460.5	30"	X-52, 309 lb/ft, ST-2 4 jnts 30" # 309,7, X-52, ST-2 + Housing jnt.	None	1.03 sg	N/A			459	459	SW		
17 1/2"	1311	20"x 13 3/8"	P110, 72 lb/ft, New Vam (Housing ext. joint: 20", X-65)	None	1.03 sg	LOT 1.72 s.g.			655	655	EZSV	70 bar above LOT (139 bar)	
											1.34 SG WBM	70 bar above LOT (122 bar)	
8 1/2"	2400 2400			None	1.34 sg	N/A					Cmt Plug #3		
											Perigon		
											1.34 sg		
											Cmt Plug #2		
				Top Melke Fm: 2055 mMD / 2055 mTVD						Cmt Plug #1			
				Top Not Fm: 2188 mMD / 2188 mTVD									
				Top Tilje Fm. 2222 mMD / 2222 mTVD									
									2400	2400			

5.6.3 *Time/depth curve*

PL 128

RKB-MSL: 23 m

Water depth: 377 m

Time-depth plot Well 6608/10-9 (Lerke)



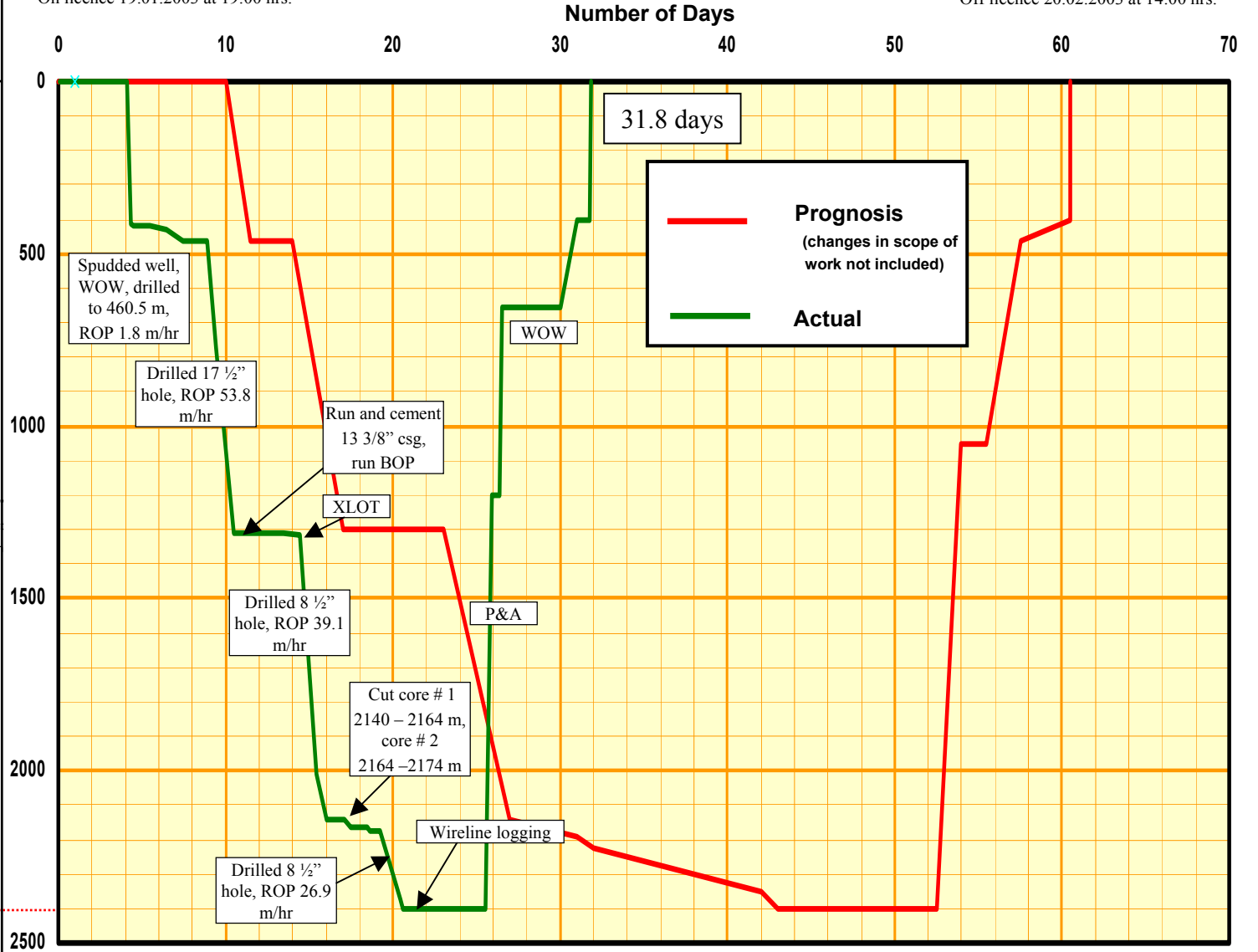
Made by: TAWJ

Date: 27.05.03

System	Stratigraphy		Lithology	Casing
	Formation Or Group	mTVD RKB		
Quat.	Seabed	400		30" at 458.5 m
	Naust	698		
Tertiary	Kai	1384.5		13 3/8" at 1305 m
	Brygge	1516.5		
	Rogaland Gp	1684		
	Springar	1779.5		
	Lyr	1820.5		
Cret.	Spekk	2055		
	Melke	2133		
Jurassic	Fangst Gp	2188		
	Tilje/Åre2	2222		
		TD 2400	mTVD RKB	

On licence 19.01.2003 at 19:00 hrs.

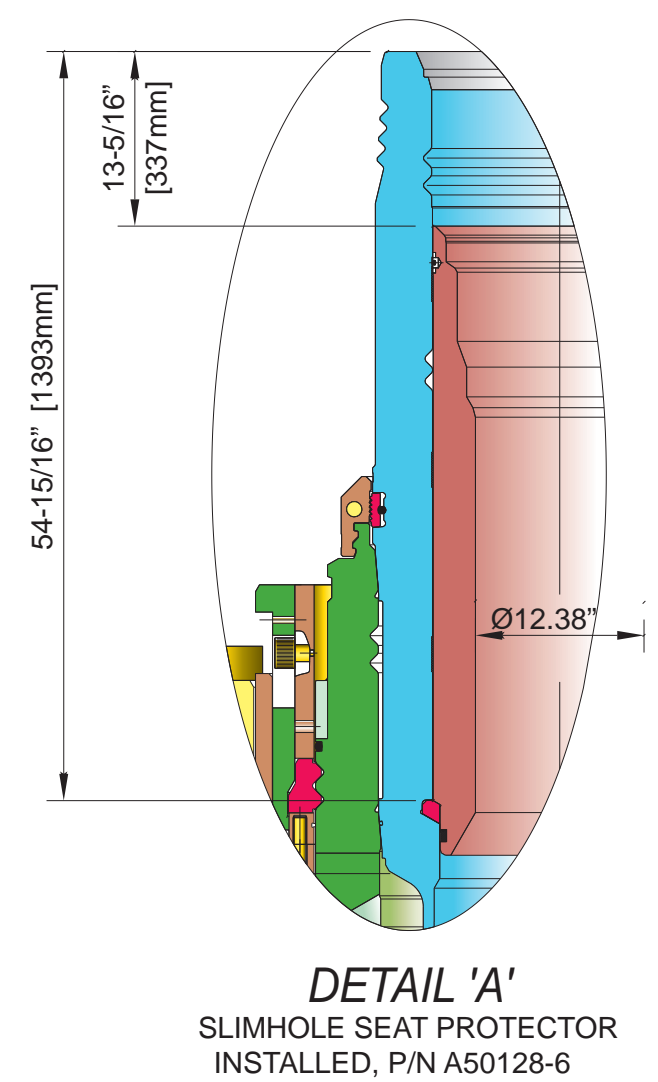
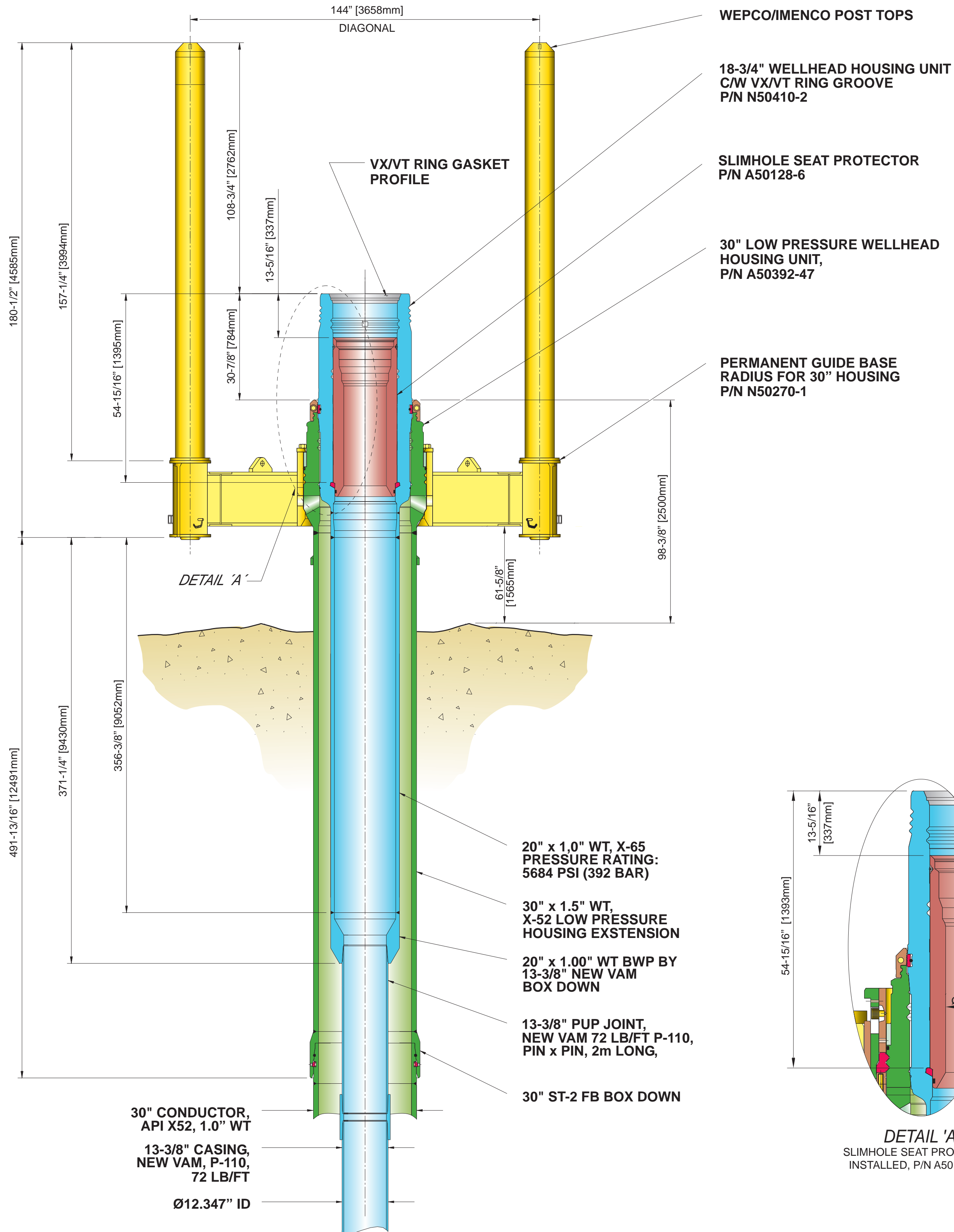
Off licence 20.02.2003 at 14:00 hrs.



5.6.4 *Timeplanner*

Fri 21.02.2003 11:12 Updated			TIMEPLANNER											STATOIL	
Sun 19.01.2003 19:00 Start date			Deepsea Bergen											Time ahead of budget:	
Thu 20.02.2003 14:00 Finish date			6608/10-9 LERKE (PL128)											15.1 days	
D A Y	START DATE	START TIME	Budg. time (hrs)	Acc. budg. time (days)	Opt. time (hrs)	Acc. opt. time (days)	Budg./ Opt. depth (mMD)	Plan time (hrs)	Actual time (hrs)	Acc. actual time (days)	Actual Depth (mMD)	Activity description	Company		
													Move		
Sun	19.01.2003	19:00	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0	F Start operation			
Sun	19.01.2003	19:00	181.0	7.5	73.0	3.0	0	72.0	73.0	3.0	0	F Transit from Beta West to location (507 nm)			
Wed	22.01.2003	20:00	48.0	9.5	29.0	4.3	0	20.0	14.0	3.6	0	F Anchor handling and ballasting			
Section time (days)			9.5	4.3				3.8	3.6			Section time ahead of/behind (-) budg:5.9 days, Tot. time ahead of/behind (-) budg:5.9 days			
													36" hole section (398 - 460 mMD)		
Thu	23.01.2003	10:00	4.0	9.7	2.5	4.4	0	3.0	2.0	3.7	0	F MU 30" running tool & cmt stand, rack back same.			
Thu	23.01.2003	12:00	8.0	10.0	5.0	4.6	0	6.0	8.0	4.0	0	F MU and RIH with 36" BHA. (meanwhile place bouys, mix spud mud)			
Thu	23.01.2003	20:00	27.0	11.2	16.5	5.3	461	14.0	14.0	4.6	416.5	F Drill 36" hole to 416.6 m MD.			
Fri	24.01.2003	10:00	0.0	11.2	0.0	5.3	461	29.0	29.0	5.8	416.5	F WOW (25 hrs) and reset anchor (4 hrs).			
Sat	25.01.2003	15:00	0.0	11.2	0.0	5.3	461	39.0	33.5	7.2	460.5	F Drill 36" hole to TD at 460 m MD (overall section ROP = 3 m/hr).			
Mon	27.01.2003	00:30	8.0	11.5	5.0	5.5	461	6.0	4.0	7.4	460.5	F Circulate hole clean, perform wiper trip and displace hole to weighted mud.			
Mon	27.01.2003	04:30	10.5	11.9	6.5	5.7	461	8.0	4.5	7.6	460.5	F POOH with 36" BHA. L/D HO Assy.			
Mon	27.01.2003	09:00	16.0	12.6	9.5	6.1	461	10.0	15.0	8.2	460.5	F RU and run 30" conductor, WH and cement stinger.			
Tue	28.01.2003	00:00	10.5	13.0	6.5	6.4	461	6.0	2.0	8.3	460.5	F Pump and displace X-Lite cement.			
Tue	28.01.2003	02:00	10.5	13.5	6.5	6.7	461	8.0	4.0	8.5	460.5	F Retrieve running tool and landing string.			
Tue	28.01.2003	06:00	11.0	13.9	6.5	6.9	461	5.0	9.0	8.8	460.5	F MU and RIH with 17 1/2" BHA.			
Tue	28.01.2003	15:00	5.5	14.2	2.5	7.0	461	3.0	4.5	9.0	460.5	F Drill out cement and 30" shoe			
Section time (days)			4.6	2.8				5.7	5.4			Section time ahead of/behind (-) budg:-0.8 days, Tot. time ahead of/behind (-) budg:5.1 days			
													17 1/2" hole section (460 - 1305 mMD)		
Tue	28.01.2003	19:30	67.0	17.0	40.5	8.7	1300	24.0	23.5	10.0	1311	F Drill 17 1/2" hole to 1300 m.			
Wed	29.01.2003	19:00	8.0	17.3	5.0	8.9	1300	3.0	2.5	10.1	1311	F Circulate hole clean.			
Wed	29.01.2003	21:30	16.0	18.0	10.0	9.4	1300	10.0	9.0	10.5	1311	F Displace to weighted mud and POOH. LD 17 1/2" BHA.			
Thu	30.01.2003	06:30	27.0	19.1	16.5	10.0	1300	23.5	25.5	11.5	1311	F RU and run 20" x13 3/8" casing.			
Fri	31.01.2003	08:00	6.5	19.4	4.0	10.2	1300	5.0	5.0	11.8	1311	F Circulate, pump and displace cement.			
Fri	31.01.2003	13:00	10.5	19.8	6.5	10.5	1300	6.0	2.5	11.9	1311	F Release RT, POOH and wash well head area. LD cement head and RT.			
Fri	31.01.2003	15:30	48.0	21.8	29.5	11.7	1300	26.0	37.5	13.4	1311	F Run BOP/ Riser and pressure test same.			
Sun	02.02.2003	05:00	6.5	22.1	3.5	11.9	1300	0.0	0.0	13.4	1311	F LD 17 1/2" BHA. (Already done)			
Sun	02.02.2003	05:00	13.5	22.6	8.0	12.2	1300	10.0	17.0	14.1	1311	F MU and rih with 8 1/2" BHA (Picked up 102 joints while RIH)			
Sun	02.02.2003	22:00	4.0	22.8	3.0	12.3	1303	3.0	5.5	14.4	1314	F Drill out shoe track and 3 m new formation.			
Mon	03.02.2003	03:30	2.5	22.9	1.5	12.4	1303	2.0	2.0	14.4	1314	F Circulate and perform FIT / XLOT.			
Section time (days)			8.7	5.3				4.7	5.4			Section time ahead of/behind (-) budg:3.3 days, Tot. time ahead of/behind (-) budg:8.5 days			
													8 1/2" hole section (1305 - 2400 mMD)		
Mon	03.02.2003	05:30	4.0	23.1	2.0	12.5	1306	3.0	1.5	14.5	1314	F Displace well to 1.34 sg WBM			
Mon	03.02.2003	07:00	94.0	27.0	57.0	14.8	2141	30.0	31.5	15.8	2140	F Drill 8 1/2" hole to 2142 m.			
Tue	04.02.2003	14:30	62.0	29.6	37.5	16.4	2161	46.0	51.0	17.9	2164	F Circulate hole clean, POOH. RIH, cut 27 m core #1 and POOH.			
Thu	06.02.2003	17:30	36.0	31.1	22.0	17.3	2181	27.0	28.0	19.1	2174	F RIH with 90 ft core barrel. Cut core #2 and POOH.			
Fri	07.02.2003	21:30	31.0	32.4	18.5	18.1	2400	35.0	33.5	20.5	2400	F RIH to resume drilling. Drill to TD at 2400 m			
Sun	09.02.2003	07:00	12.0	32.9	7.5	18.4	2400	9.0	11.0	21.0	2400	F Circulate hole clean, POOH.			
Sun	09.02.2003	18:00	10.0	33.3	3.0	18.5	2400	4.0	7.5	21.3	2400	F L/D 8 1/2" BHA and 8 1/2" core assembly. PU and RB 27 jts. of 3 1/2" DP.			
Mon	10.02.2003	01:30	0.0	33.3	0.0	18.5	2400	2.0	2.0	21.4	2400	F RU for Wireline logging.			
Mon	10.02.2003	03:30	14.5	33.9	9.0	18.9	2400	8.0	8.0	21.7	2400	F Electric logging run #1: PEX-HALS-HNGS			
Mon	10.02.2003	11:30	14.5	34.5	9.0	19.3	2400	9.0	9.0	22.1	2400	F Electric logging run #2: VSP			
Mon	10.02.2003	20:30	13.5	35.0	8.0	19.6	2400	10.0	9.5	22.5	2400	F Electric logging run #3: FMI-DSI			
Tue	11.02.2003	06:00	18.0	35.8	9.0	20.0	2400	15.0	11.0	22.9	2400	F Electric logging run #4: MDT - pp			
Tue	11.02.2003	17:00	32.5	37.1	13.0	20.5	2400	25.0	26.5	24.0	2400	F Electric logging run #5: MDT - samples			
Wed	12.02.2003	19:30	14.5	37.8	9.0	20.9	2400	20.0	18.0	24.8	2400	F Electric logging run #6: CST			
Section time (days)			14.9	8.5				10.1	10.3			Section time ahead of/behind (-) budg:4.5 days, Tot. time ahead of/behind (-) budg:13.0 days			
													P&A		
Thu	13.02.2003	13:30	27.0	38.9	16.0	21.6	2400	5.0	9.5	25.2	2400	F PU cement stinger and RIH to TD.			
Thu	13.02.2003	23:00	24.0	39.9	15.0	22.2	1900	8.0	7.5	25.5	1910	F Plug back reservoir section with cement.			
Fri	14.02.2003	06:30	10.5	40.3	6.5	22.5	1150	8.0	9.0	25.9	1200	F POOH to 1460 m. Install CST and set cmt plug from 1450 to 1200 m.			
Fri	14.02.2003	15:30	7.0	40.6	5.0	22.7	1150	5.0	7.0	26.1	1200	F POOH. LD pipe while POOH			
Fri	14.02.2003	22:30	6.5	40.9	4.0	22.8	1150	6.0	3.0	26.3	1200	F WOC. L/D pipe. L/D ABB hang off tool			
Sat	15.02.2003	01:30	13.5	41.4	8.0	23.2	650	5.0	4.5	26.5	655	F MU 13 3/8" EZSV. Pressure test cmt plug. RIH on 5 1/2" DP to 650m. Set EZSV. Close UAP and pressure test EZSV			
Sat	15.02.2003	06:00	8.0	41.8	5.0	23.4	460	6.0	6.0	26.7	655	F Displace hole to SW. POOH.			
Sat	15.02.2003	12:00	4.0	41.9	1.0	23.4	450	75.0	77.5	29.9	655	F MU WB RR tool, Pull WB (L/D pipe while WOW to pull BOP).			
Tue	18.02.2003	17:30	48.0	43.9	29.5	24.6	450	26.0	20.5	30.8	400	F Pull riser and BOP.			
Wed	19.02.2003	14:00	23.0	44.9	14.0	25.2	450	10.0	9.0	31.2	400	F Install FMC overtrawable structure.			
Wed	19.02.2003	23:00	48.0	46.9	29.5	26.5	399	20.0	15.0	31.8	400	F Deballast rig and pull anchors.			
Thu	20.02.2003	14:00	0.0	46.9	0.0	26.5	0	0.0	0.0	31.8	0	F END OF WELL			
Thu	20.02.2003	14:00	9.1	5.6				7.3	7.0			Section time ahead of/behind (-) budg:2.1 days, Tot. time ahead of/behind (-) budg:15.1 days			
End of operation															

5.6.5 *Wellhead system*



MS-700 Wellhead System
18-3/4" x 15,000 PSI

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5.6.6 *Drilling fluids*

Well: 6608/10-9
 Field: Lerke
 Rig: Deepsea Bergen

DRILLING FLUIDS PROGRAMME

HOLE		CASING		MUD TYPE	MW [g/cm ³]	LGS [kg/m ³]	10 sec. [Pa]	10 min. [Pa]	Fann 100 rpm [lb/sqft]	Fann 3 rpm [lb/sqft]	PV [cP]	FV [sec]	HTHP FL [ml]	YP [Pa]	pH	Activity	ES [Volt]	Ex. Lime [kg/m ³]	OWR [vol %]	Total Volume Old Volume New Volume Usage [m ³]
SIZE	TVD MD	SIZE	TVD MD																	
36"	460,5	30"	458,5	SW/ Bentonite/CMC sweeps	1,03 - 1,35							>200			8 - 9					461 0 461 241 60 m3 kill mud mixed and transferred
				<p>COMMENTS, Ref. Anchor/M-I, Operational Procedures - Rev. 0 - 20.03.00: Prior to spuding mix 62 m3 - 1,6 sg kill fluid. Due to problems with drill water supply and also some problems with getting the bentonite to gel, all the kill fluid, sweeps and displacement fluid was mixed as a combination of bentonite and CMC-EHV fluid. 60 m3 of kill mud - density 1,6 sg - was built and stored in pit # 7. The hole was drilled with sea water, pumping 8-10 m3 of high vis sweeps every 15 m drilled. At TD the hole was swept with a 30 m3 high vis pill before displacing the hole to 1,35 sg displacement fluid and pulling out to run conductor. The kill mud was transferred to the 17 1/2" section.</p>																
17 1/2"	1 311	13 3/8"	1 305	SW/ Bentonite/CMC sweeps	1,03 - 1,30							>200			8 - 9					664 220 444 664
				<p>COMMENTS, Ref. Anchor/M-I, Operational Procedures - Rev. 2 - 18.08.02: Due to problems with drill water supply and also some problems with getting the bentonite to gel, all the sweeps and the displacement fluid was mixed as a combination of bentonite and CMC-EHV fluid. 60 m3 of kill mud - density 1,6 sg - was received from previous section. The hole was drilled with sea water, pumping 8-10 m3 of high vis sweeps every 15 m drilled. At TD the hole was swept with with a 30 m3 high vis pill before displacing the hole to 1,30 sg displacement fluid - displacement fluid was mixed by diluting the kill mud to 1,30 sg. The 13 3/8" casing was run and cemented without any problems.</p>																
8 1/2"	2 400	NA		Glydril (KCL/ Pac/Glycol) 99% KCl	1.34	123 - 154	4 - 5	6 - 7	29 - 30	5 - 9	16 - 21	70 - 78	n/a 1,8 - 2 API	9 - 16	8,4 - 8,6					498 0 498 125
				<p>COMMENTS, Ref. Anchor/M-I, Operational Procedures - Rev. 2 - 18.08.02: Saturated 99 % KCl brine was mixed up at the Sandnessjøen base and shipped to the rig. The brine was diluted 50:50 in order to achieve a final fluid concentration of +/- 240 kg/m3 of KCl. A total of 245 m3 of Glydril 99% KCl fluid at a density of 1,34 sg, was mixed and displaced to the hole after finished drilling shoetrack and performed XLOT. The sulphate content of the fresh fluid was 200- 220 mg/ltr, but after the fluid had been displaced to the hole and the drilling started, the sulphate content decreased to 130 - 140 mg/ltr and stayed stable at this value for the rest of the operation. The KCl concentration was maintained at 135 - 140 kg/m3. When drilling, a relatively high ECD value was seen and after pulling out of the hole a lot of clay was observed on the BHA - it is therefore recommended to increase the KCl level to +/- 150 kg/m3 for future operations in this area. Glycol concentration was maintained in the range of 3,5 - 4,3 % by volume - which can be recommended for future operations. API fluid loss was very stable at 1,8 to 2,0 cc/30 min - and there was no problem observed during the period of coring and logging operations.</p>																

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5.6.7 *Cementing data*

Well: **6608/10-9**
 Field: **Lerke**
 Rig: **Deepsea Bergen**

CEMENT PROGRAM

HOLE		CASING SHOE		TOC	VOLUME/ EXCESS	CEMENT SLURRY DESIGN										SPACER	DISPLACEMENT
SIZE	TVD MD	SIZE	TVD MD	TVD MD		Components	Lead [ltr/100kg]	Tail [ltr/100kg]	Density [g/cm ³]	Yield [ltr/100kg]	Stat. / Circ. Temp [°C]	Thickening time [hrs to 30 Bc]	API Free Water [%]	API Fluid loss [cc/30min]	24 hrs C. S. [psi]	Fluids and Rates	
36"	460,5	30"	458,5	400	48,6 m ³ 300%	X-lite cmt (100 kg) CaCl2 liquid NF-6 Sea water		4.50 0.10 49.73	1.53	102.83 Code DWLSP	6-8	01:10 (70 BC)	n/a	n/a	1000	Min. 30 m3 Sea water	Sea water 1000 - 2000 lpm
17 1/2"	1 311	13 3/8"	1 305	400	Lead: 86,5 m ³ Tail: 15 m ³ 50% (Lead)	Norcem "G" Cmt. (100 kg) Econolite HR-4L NF-6 Sea water Fresh Water	3.20 1.50 0.10 94.01 -	- 0.10 -	L: 1,56 T: 1,92	L: 129,861 Code STL40 T: 74,93 Code STTNT	41/32	L: 05:05 T: 03:56	n/a	n/a	L: 600 T: 1800	Casing volume Sea water	Sea water 3000 lpm
8 1/2"	2 400	OH Plug	2 400	1 910	2 x 9,7 m3 Calliper vol.	Norcem "G" Cmt. (100 kg) Gascon Halad-613L CFR-3L HR-5L NF-6 Fresh water		3.50 7.00 2.00 0.80 0.10 33.30	1.90	77.75 Code GTT90	87/71	05:00	0	20	3000	5,8 + 5 m3 1,62 SG Tuned Spacer	WBM 2000 - 2500 lpm
		8 1/2" x 13 3/8" Transition Plug	1 450	1 200	16,5 m3 Calliper vol.	Norcem "G" Cmt. (100 kg) HR-4L Halad-613L NF-6 Freshwater		0.50 0.50 0.10 42.89	1.92	75.05 Code MPT14	45/36	03:30	0.6	n.a.	1600	8 m3 1,62 SG Tuned Spacer	WBM 2000 - 2500 lpm

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5.6.8 *Bit record*

Bit record

Wellbore: 6608/10-009

Run No	Bit Size	Bit No	BHA No	Bit Type	IADC code	Bit manufacturer	Serial No	Nozzles (n/32")				Flow Area in2
								no x n	no x n	no x n	no x n	
1	17 1/2"	1	1	MGSSH+ODC	115	Smith Bits	LW2339	3 x 18	1 x 14	x	x	,896
	26"/36"		1	HOLEOPENER	441X	Smith Red Baron		12 x 12	x	x	x	1,326
2	17 1/2"	2	2	MXT1	115	Hughes Christensen	T68DP	3 x 20	1 x 14	x	x	1,071
3	8 1/2"	3	3	FS2565E	S424	Security DBS	10418965	5 x 13	x	x	x	,649
4	8 1/2"	4	4	CT103	M623	DIAMANT BOART S	7960500	x	x	x	x	
5	8 1/2"	5	5	CT103	M623	DIAMANT BOART S	7940104	x	x	x	x	
6	8 1/2"	6	6	FS2565E	S424	Security DBS	5011718	5 x 13	x	x	x	,649

Run No	Bit Size	Pump Rate l/min	Pump Press bar	Depth in mMD	Depth out mMD	Drilled length m	Hours Drilled	ROP	Min WOB ton	Max WOB ton	Min RPM	Max RPM	Torque Min Nm	Torque Max Nm	Con drag Min 1000 daN	Con drag Max 1000 daN
1	17 1/2"	4870	120	400	460,5	60,5	34,4	1,8	0	3	100	130	3000	16000		
	26"/36"	4600	107	400	460,5	60,5	34,4	1,8	0	3	100	130	3000	16000		
2	17 1/2"	4411	200	460,5	1311	850,5	15,8	53,8	1	12	105	156	3	19		
3	8 1/2"	2550	210	1311	2140	829	21,2	39,1	0	11	60	168	2	10	0	6
4	8 1/2"	600	67	2140	2164	24	3,7	6,5	5	13	70	110	4000	18000		
5	8 1/2"	1000	87	2164	2174	10	1,8	5,6	5	12	70	110	2700	24400		
6	8 1/2"	2500	205	2174	2400	226	8,4	26,9	2	14	90	160	3000	17000		

Run No	Bit Size	IADC dull grading								Remarks
		I	O	DC	L	B	G	OC	RP	
1	17 1/2"	4	6	RG	S	E	3	SD	TD	
	26"/36"	1	2	FC	A	F	3	NO	TD	
2	17 1/2"	4	3	WT	A	E	I	NO	TD	
3	8 1/2"	5	3	RO	S	X	I	LT	CP	
4	8 1/2"	4	5	CT	A	X	I	WT	PR	Minor junk marks on the bit.
5	8 1/2"	2	2	WT	A	X	I	CT	PR	Core jammed off after 10 m.
6	8 1/2"	1	1	WT	A	X	I	NO	TD	ROP restricted due to rig heave.

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5.6.9 *Bottomhole assemblies*

BHA report

Wellbore: 6608/10-009

BHA seq: 1 **BHA category:** Drilling **BHA description:** Top hole / holeopener BHA
BHA no: 1

String component	OD in	ID in	Length m	Acc length m
BIT	17,500		0,42	0,42
FLOAT SUB	11,250		0,89	1,31
HOLE OPENER	26,000		1,78	3,09
HOLE OPENER	36,000		2,60	5,69
ANDERDRIFT	9,375		3,03	8,72
X-OVER	9,500		0,70	9,42
DRILL COLLAR	8,000	2,813	106,24	115,66
X-OVER	7,938		1,09	116,75
HW DRILL PIPE	0,550	3,875	80,74	197,49
DRILL PIPE	5,500	4,778		197,49

BHA seq: 2 **BHA category:** Drilling **BHA description:** Pendulum BHA
BHA no: 2

String component	OD in	ID in	Length m	Acc length m
BIT, TRI CONE	17,500		0,40	0,40
BIT SUB	9,500		0,91	1,31
X-O PIN X PIN	9,500		0,40	1,71
MWD, MPR	8,250		5,04	6,75
MWD, DCP	8,250		11,29	18,04
SAVER SUB	8,000		0,92	18,96
STAB STRING	17,500	3,500	1,62	20,58
DRIL COL	8,000	2,875	8,91	29,49
STAB STRING	17,500	3,000	1,86	31,35
DRILL COL	8,000	2,875	79,03	110,38
JAR	7,750	3,000	9,67	120,05
DRILL COL	8,000	2,875	18,30	138,35
XO SUB	7,940	2,750	1,09	139,44
HW DRILL PIPE	7,250	3,875	80,74	220,18

BHA seq: 3 **BHA category:** Drilling **BHA description:** Packed core point finder BHA
BHA no: 3

String component	OD in	ID in	Length m	Acc length m
BIT	8,500		0,32	0,32
STAB. NB W/FLOAT	8,500	3,000	1,21	1,53
ON TRAK	6,750	3,000	5,15	6,68
STAB STRING	8,500	3,000	1,31	7,99
BCPM	6,750	3,000	3,25	11,24
STOP SUB	6,500	2,750	0,49	11,73
STAB. W/TOTCO	8,500	2,750	1,99	13,72
DRILL COLLAR	6,500	2,750	65,74	79,46
JAR	6,500	2,750	9,53	88,99
DRILL COL	6,500	2,750	18,67	107,66
X-OVER	5,500	3,000	0,99	108,65
HW DRILL PIPE	5,500	3,000	80,74	189,39

BHA seq: 4 **BHA category:** Drilling **BHA description:** Coring BHA
BHA no: 4

String component	OD in	ID in	Length m	Acc length m
CORE HEAD	8,500		0,36	0,36
CORE BARREL W/FLOAT	6,750		31,89	32,25
DRILL COLLAR	6,500	2,750	112,77	145,02
XO SUB	7,125	3,000	0,99	146,01
HW DRILL PIPE	5,500	3,875	71,90	217,91
XO SUB	7,250	2,812	1,80	219,71

BHA report

Wellbore: 6608/10-009

BHA seq: 4 **BHA category:** Drilling **BHA description:** Coring BHA

BHA no: 4

String component	OD in	ID in	Length m	Acc length m
JAR	6,500	2,687	9,53	229,24
XO SUB	6,625	2,844	1,23	230,47
HW DRILL PIPE	5,500	3,875	36,03	266,50

BHA seq: 5 **BHA category:** Drilling **BHA description:** Coring BHA

BHA no: 5

String component	OD in	ID in	Length m	Acc length m
CORE HEAD	8,500		0,36	0,36
CORE BARREL W/FLOAT	6,750		31,00	31,36
DRILL COLLAR	6,500	2,750	112,77	144,13
XO SUB	7,125	3,000	0,99	145,12
HW DRILL PIPE	5,500	3,875	71,90	217,02
XO SUB	7,250	2,812	1,80	218,82
JAR	6,500	2,687	9,53	228,35
XO SUB	6,625	2,844	1,23	229,58
HW DRILL PIPE	5,500	3,875	36,03	265,61

BHA seq: 6 **BHA category:** Drilling **BHA description:** Packed core point finder BHA

BHA no: 6

String component	OD in	ID in	Length m	Acc length m
BIT	8,500		0,33	0,33
STAB. NB W/FLOAT	8,500	3,000	1,21	1,54
ON TRAK	6,750	3,000	5,15	6,69
STAB STRING	8,500	3,000	1,31	8,00
BCPM	6,750	3,000	3,25	11,25
STOP SUB	6,500	2,750	0,49	11,74
STAB. W/TOTCO	8,500	2,750	1,99	13,73
DRILL COLLAR	6,500	2,750	56,38	70,11
JAR	6,500	2,750	9,57	79,68
DRILL COL	6,500	2,750	28,24	107,92
X-OVER	5,500	3,000	0,99	108,91
HW DRILL PIPE	5,500	3,000	80,74	189,65

6 Appendix

App A Operational listing

Wellbore: 6608/10-9

Time from	Time to	Time used	Depth mMD	---- Status ----			Description of activities
				Act code	During opr	End of opr	
19.01.2003.19:00	00:00	5,0		MNMU	OK	OK	Rig in transit from well 16/7-8S, Beta West. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9.
20.01.2003.00:00	06:00	6,0		MNMU	OK	OK	Rig in transit. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9. Total sailed distance: 91 nm. Distance to go: 415 nm. Average speed: 8,0 knots. ETA: Wednesday 22.01.03 at 07:00 hrs. Position at 06:00 hrs: 59 deg 35' N, 03 deg 01' E.
20.01.2003.06:00	00:00	18,0		MNMU	OK	OK	Rig in transit. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9. Sailed distance: 138 nm, average speed 7,7 knots. Total sailed distance: 229 nm, average speed 7,9 knots. Distance to go: 278 nm. Position at 00:00 hrs: 61 deg 59' N, 03 deg 15' E.
21.01.2003.00:00	06:00	6,0		MNMU	OK	OK	Rig in transit. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9. Sailed distance: 43 nm, average speed 7,2 knots. Total sailed distance: 272 nm, average speed 7,8 knots. Distance to go: 235 nm. Position at 06:00 hrs: 62 deg 46' N, 03 deg 24' E. ETA: Wednesday 22.01.03 at 17:00 hrs.
21.01.2003.06:00	00:00	18,0		MNMU	OK	OK	Rig in transit. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9. Sailed distance: 103 nm, average speed 5,7 knots. Reduced speed to 4 knots from 15:30 hrs to 22:00 hrs due to waves hitting bracings. Total sailed distance: 375 nm, average speed 7,1 knots. Distance to go: 132 nm. Position at 00:00 hrs: 64 deg 18' N, 05 deg 04' E.
22.01.2003.00:00	06:00	6,0		MNMU	OK	OK	Rig in transit. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9. Sailed distance: 44 nm, average speed 7,3 knots. Total sailed distance: 419 nm, average speed 7,1 knots. Distance to go: 88 nm. Position at 06:00 hrs: 64 deg 59' N, 05 deg 48' E. ETA: Wednesday 22.01.03 at 19:00 hrs.
22.01.2003.06:00	20:00	14,0		MNMU	OK	OK	Rig in transit. Skandi Bergen towing on anchor chain #2 and Olympic Poseidon on anchor chain #9. Arrived location at 19:40 hrs. Sailed distance: 88 nm, average speed 6,3 knots. Total sailed distance: 507 nm, average speed: 7,0 knots. Dropped anchor #5.
22.01.2003.20:00	00:00	4,0		MARU	OK	OK	Anchor handling: Anchor #9: Olympic Poseidon. Anchor on bottom at 21:40 hrs. Pendant to rig 22:40 hrs. Anchor #2: Skandi Bergen. Anchor on bottom at 21:35 hrs. Pendant to rig 22:20 hrs. Anchor #3: Skandi Bergen. Pendant to boat at 22:30 hrs. Anchor on bottom at 23:30 hrs. Pendant to ria 00:25 hrs.

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						Anchor #6: Olympic Poseidon. Pendant to boat at 22:55 hrs. Anchor on bottom at 00:05 hrs. Pendant to rig 00:45 hrs.	
23.01.2003.00:00	06:00	6,0		MARU	OK	OK	Anchor handling: Anchor #4: Skandi Bergen. Pendant to boat at 00:35 hrs. Anchor on bottom at 01:40 hrs. Pendant to rig 02:35 hrs. Anchor #8: Olympic Poseidon. Pendant to boat at 00:55 hrs. Anchor on bottom at 01:50 hrs. Pendant to rig 02:25 hrs. Anchor #7: Olympic Poseidon. Pendant to boat at 02:30 hrs. Anchor on bottom at 03:30 hrs. Pendant to rig 04:00 hrs. Ballasted rig from 02:00 hrs.
23.01.2003.06:00	08:30	2,5		MNBU	OK	OK	Ballasted rig to 22 m draught.
23.01.2003.08:30	10:00	1,5		MARU	OK	OK	Tension tested all anchors to 180 tons / 15 min. Meanwhile started preparing spud mud and P/U 8" DC.
23.01.2003.10:00	10:30	0,5		DTPU	OK	OK	P/U and M/U 12 x 8" DC. Meanwhile mixing spud mud and positioning rig.
23.01.2003.10:30	12:00	1,5		DDOU	OK	OK	M/U cement stand and 30" CART, racked same in derrick.
23.01.2003.12:00	20:00	8,0	400,0	DTDU	OK	OK	P/U 26"/ 36" hole opener and ran in to 10 m above sea bed. Tested underdrift on the way in, inclination 0,25 deg. Tagged bottom at 400 m at 17:38 hrs. Lowered basket for marker buoys and transponder to sea bed. ROV placed 3 marker buoys approx. 6 m from spud position. Meanwhile mixed spud mud.
23.01.2003.20:00	00:00	4,0	413,0	DDRU	OK	OK	Spudded well. Drilled from 400 m to 410 m using seawater, flow 1000-2000 lpm, 30-50 rpm, WOB 0-2 tons. Drilled to 413 m, increased flow rate to 4600 lpm and rpm to 100.
24.01.2003.00:00	01:30	1,5	413,0	DDOU	OK	OK	Pumped 5 m3 havis pill, chased same aro und. Took survey with underdrift, pumping 3000 lpm, got 1,75 deg inclination. Worked string / reamed last 4 m. Took new survey with 1400 lpm, inclination 1,75 deg. Checked/adjusted rig position, took new survey with 2000 lpm, inclination still 1,75 deg. Pulled out to 405 m. Meanwhile prepared to change anchor #2, pendant delivered to Boa Giant at 01:15 hrs.
24.01.2003.01:30	04:00	2,5	413,0	MARK	OK	OK	Boa Giant P/U anchor #2. Had to lower anchor back on bottom due to sea conditions. Tension tested anchor #2 to 180 tons/15 min. Adjusted rig position.
24.01.2003.04:00	06:00	2,0	416,0	DDRU	OK	OK	Took underdrift survey, got 1,25 deg inclination. Drilled from 413 to 416 m using sea water and high viscosity pills. Flow 4600 lpm, 130 rpm, WOB 0-3 tons.
24.01.2003.06:00	08:30	2,5	416,5	DDRU	OK	OK	Drilled from 416 m to 416, 5 m. Flow 4600 lpm, pressure 104 bar, 130 rpm, WOB 0-3 tons, torque 2-13 kNm.
24.01.2003.08:30	10:00	1,5	375,0	DDOU	OK	OK	Stopped drilling and reduced pump rate due to weather conditions and need for power to rig thrusters. P/U 5 m. Pumped 16 m3 1,35 sg mud. Pulled out to 20 m above sea bed.
24.01.2003.10:00	00:00	14,0	375,0	DDWW	OK	OK	WOW. Deballasted rig, rig at survival draught at 11:20 hrs. Started ballasting rig at 22:15 hrs, rig at drilling draught at 23:35 hrs.
25.01.2003.00:00	01:00	1,0	375,0	DDWW	OK	OK	WOW. Meanwhile checked position with ROV, adjusted rig position. Evaluated possibility for re-entering well, not possible due to rig heave and very poor visibility.
25.01.2003.01:00	05:30	4,5	375,0	DDWW	OK	OK	WOW.
25.01.2003.05:30	06:00	0,5	398,0	DDWW	OK	OK	WOW. Positioned rig to re-enter well, assisted by ROV. Poor visibility.
25.01.2003.06:00	11:00	5,0		DDWW	OK	OK	WOW. Attempted to stab back into the hole. Failed due to poor visibility and excessive rig heave.
25.01.2003.11:00	15:30	4,5	410,0	DDRU	OK	OK	Positioned the rig. Stabbed into the hole and drilled 36" hole 416-417m, 0-3 ton WOB, 100-125 rpm, 7-31kNm, 4500 lpm, 102 bar. Took survey. Had 1.75 deg at 411m. Displaced hole to 1.35 sg mud. POOH to 410 m.

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25.01.2003.15:30	19:30	4,0	410,0	DEOU	OK	OK	Changed out anchor no 2, and tensioned same to 180 ton. Rotated the Bha while changing out the anchor.
25.01.2003.19:30	00:00	4,5	423,0	DDRU	OK	OK	Took survey. Had 1.0 deg at 417 m. Tagged 1 m fill. Washed to bottom and continued drilling to 423 m, 0-3 ton WOB, 130 rpm, 4500 lpm, 106 bar.
26.01.2003.00:00	06:00	6,0	430,0	DDRU	OK	OK	Cont. drilling 36" Hole 423-430 m. 0-3 ton WOB, 90-130 rpm, 4700 lpm, 110 bar.
26.01.2003.06:00	12:00	6,0	435,0	DDRU	OK	OK	Drilled 36" hole 430-435 m, 0-3 ton WOB, 100-130 rpm, 3-16 kNm, 4700 lpm, 109 bar.
26.01.2003.12:00	18:00	6,0	444,0	DDRU	OK	OK	Drilled 36" hole 435-444 m. Pumped hivisc pills every 10-15 m. Took survey at 435 m, 1 deg.
26.01.2003.18:00	00:00	6,0	457,0	DDRU	OK	OK	Drilled 36" hole 444-457 m. Took survey. Had 1.5 deg at 448 m.
27.01.2003.00:00	00:30	0,5	460,5	DDRU	OK	OK	Drilled 36" hole 457-460.5 m,
27.01.2003.00:30	01:00	0,5	460,5	DUSU	OK	OK	Checked Bha depth using the ROV. Took survey 1.0 deg at 458.5 m.
27.01.2003.01:00	02:00	1,0	460,5	DCRK	OK	OK	Reamed tight hole. Had indications of boulders. Swept the hole with 10 m3 Hivisc pill.
27.01.2003.02:00	02:30	0,5	460,5	DUSU	OK	OK	Checked space out using the ROV.
27.01.2003.02:30	04:00	1,5	460,5	DCRK	OK	OK	Reamed tight hole. Had indications of boulders in the hole. Swept the hole pumping 30 m3 Hivisc pill around.
27.01.2003.04:00	04:30	0,5	460,5	DCAU	OK	OK	Displaced hole to 1.35 sg mud. Dropped single shot.
27.01.2003.04:30	06:00	1,5	210,0	DTCU	OK	OK	POOH. Top up the hole with 1.35 sg mud. Cont POOH.
27.01.2003.06:00	08:30	2,5		DTCU	OK	OK	POOH the Bha. Retrieved Single Shot showing 0.75 deg.
27.01.2003.08:30	09:00	0,5		DEOU	OK	OK	Inspected Top Drive and Derrick. Cleared and cleaned the Drill Floor.
27.01.2003.09:00	11:00	2,0		CERU	OK	OK	R/U to run 30" Casing. Had Pre-Job and SJA Meetings.
27.01.2003.11:00	16:00	5,0		CARU	OK	OK	P/U 30" Shoe Joint. Checked Float. Cont running 3 Intermediary Joints and Housing Joint. Ran 5.5" DP Stinger by means of False Rotary, and M/U to CART. Ran and landed in PGB in the Moon Pool.
27.01.2003.16:00	20:00	4,0		CARU	OK	OK	Cont. run 30" Casing on 5.5" DP. Filled the string on the way in. Checked zero position of Bulls Eyes by means of the ROV. Circulated out Air and closed the Vent Valve of the CART using the ROV. Positioned the Rig and entered the 36" hole. RIH to TD.
27.01.2003.20:00	20:30	0,5		CARU	OK	OK	Installed Cem Stand and made up Cem. Hose. RIH and landed 30" Casing on bottom while circulating 500 lpm.
27.01.2003.20:30	21:00	0,5		CCCU	OK	OK	Circulated 30 m3, 4000 lpm, 33 bar. Checked CART Valve and returns using the ROV. Tested Surface lines 100 bar/5 min. Had Pre-Cementing Meeting.
27.01.2003.21:00	23:30	2,5		CARU	OK	OK	Established Guide Wires, Checked Bulls Eyes, heading and height of the Conductor by the ROV. Checked release of CART. Maintained 600 lpm/2 bar circulation of the annulus.
27.01.2003.23:30	00:00	0,5		CCCU	OK	OK	Lined up to pump cementunit. Flushed lines with 500 l Sea Water.
28.01.2003.00:00	02:00	2,0		CSSU	OK	OK	Mix and pumped 48.6 m3 1.53 sg X-lite Cement Slurry. Displaced the cement by 8.0 m3 Sea Water. Bled off and checked Float, ok.
28.01.2003.02:00	04:00	2,0		CSOU	OK	OK	Released and POOH the CART. Flushed the Cementing String 5000 lpm/5 min. POOH.
28.01.2003.04:00	06:00	2,0		CSOU	OK	OK	POOH the Landing String. L/D the CART. L/D Cementing Stand and organized pipe in the Derrick.
28.01.2003.06:00	09:00	3,0		DTAK	OK	OK	P/U10 stds 5.5" DP, and rack back in Derrick. Cleaned Rig Floor.
28.01.2003.09:00	15:00	6,0	432,0	DTAK	OK	OK	P/U and ran 17.5" Bha. Attached Guide Ropes 4 m above the Bit. RIH to 380 m. Positioned the Rig and Stabbed into the 30" WH. Cont RIH to above the cement.

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28.01.2003.15:00	19:30	4,5	460,5	DDRU	OK	OK	Washed down and tagged TOC at 453.5 m. Drilled cement and Shoe 0-4 ton WOB, 2-7kNm, 65 rpm, 4200 lpm, 180 bar. Cleaned out Rat Hole to 460.5 m, 4500 lpm, 200 bar, 50-70 rpm.
28.01.2003.19:30	00:00	4,5	568,0	DDRU	OK	OK	Drilled 17.5" Hole 460.5-568 m, 0-5 ton WOB, 80-130 rpm, 3000-4500 lpm, 95-200 bar. Pumped 7 m3 HiVisc Pill every 15 m.
29.01.2003.00:00	06:00	6,0	770,0	DDRU	OK	OK	Continue drilling 17.5" to 770 m, 0-5 ton WOB, 130-150 rpm, 3000-4500 lpm, 98-205 bar, 2-13 kNm. Pumped 7 m3 HiVisc Pill prior to each connection.
29.01.2003.06:00	12:00	6,0	1030,0	DDRU	OK	OK	Drilled 17.5" hole 770-1030 m, 0-7 ton WOB, 150 rpm, 4-14 kNm, 4500 lpm, 205 bar. Circ around 14 m3 HiVisc pill prior to each connection.
29.01.2003.12:00	19:00	7,0	1311,0	DDRU	OK	OK	Drilled 17.5" hole 1033-1311 m, 10-15 ton WOB, 150 rpm, 8-20 kNm, 4500 lpm, 220 bar. Circ around 10-15 m3 HiVisc pill prior to each connection.
29.01.2003.19:00	22:30	3,5	1311,0	DCWK	OK	OK	Circ B/U. Circulated 30 m3 HiVisc pill around. Displaced the hole to 1,30 sg Mud. Flow check.
29.01.2003.22:30	00:00	1,5	915,0	DTCU	OK	OK	Dropped 2.75" Drift. POOH to 915 m. Max overpull up to 20 ton.
30.01.2003.00:00	02:30	2,5	384,0	DTCU	OK	OK	Cont POOH to 384 m.
30.01.2003.02:30	06:00	3,5		DTBU	OK	OK	Washed Guide Base. POOH to surface. L/D MWD.
30.01.2003.06:00	06:30	0,5		DTBU	OK	OK	Racked back 17 1/2" Bha in derrick. LD MWD and Bit and stabilizer. Unable to break connection between pre-made assemblies.
30.01.2003.06:30	08:00	1,5		CAOU	OK	OK	MU and set back Cement Stand in derrick.
30.01.2003.08:00	09:00	1,0		RMRU	OK	OK	Inspected Top Drive and derrick.
30.01.2003.09:00	10:00	1,0		CERU	OK	OK	RU to run 13 3/8" casing.
30.01.2003.10:00	10:30	0,5		CERU	OK	OK	Held pre-job safety meeting and SJA on drill floor.
30.01.2003.10:30	19:00	8,5	340,0	CARU	OK	OK	PU shoe joint. checked float. PU and MU intermediate joint and landing collar joint. Held SJA meeting prior to attaching ropes on casing due to rough weather. Attached guide ropes between shoe joint and guide wires in moon pool. Thread locked first 3 connentions. Checked Float. Ran 13 3/8" Casing to 340 m. Difficulties with ice forming on threads when cleaning casing on deck. Had to steam clean threads and apply dope on rig floor. Had to replace 4 joints due to damaged seal face.
30.01.2003.19:00	19:30	0,5	340,0	CARU	OK	OK	Held pre-job safety meeting with new crew on drill floor.
30.01.2003.19:30	00:00	4,5	715,0	CARU	OK	OK	Ran 13 3/8" casing from 340 m to 715 m. Ice forming on threads when cleaning casing on deck. Had to steamclean threads and apply dope on drill floor.
31.01.2003.00:00	03:00	3,0	895,0	CARU	OK	OK	Ran 13 3/8" casing from 715 m to 895 m. Ice forming on threads when cleaning casing on deck. Had to steamclean threads and apply dope on drill floor.
31.01.2003.03:00	05:00	2,0	905,0	CARU	OK	OK	Changed to frame 1 elevators for 5 1/2" DP. PU and installed 18 3/4" WH assy. Topped up void above plug. RD casing running equipment.
31.01.2003.05:00	06:00	1,0	1141,0	CARU	OK	OK	RIH 13 3/8" casing on 5 1/2" DP to 1141 m. Filled up every 3rd stand. Max 7 ton loss of weight while running in.
31.01.2003.06:00	08:00	2,0		CARU	OK	OK	RIH 13.375" Casing on 5.5" DP from 1141 m. Tagged restriction at 1281 m. Set down 40 ton. Nogo. Made up Landing String to Top Drive and circulated past restriction pumping 1000 lpm, 30 bar. Installed and hooked up Cement Stand and circulated down 460 lpm, 30 bar. Had no fill. Landed 18. 75" WH at 0745 hrs. Took 25 ton over pull test.
31.01.2003.08:00	09:30	1,5		CCCU	OK	OK	Circulated and conditioned annulus pumping 128 m3 sea water at 2300 lpm, 102 bar. Conducted pre-cementing meeting with involved personnel.
31.01.2003.09:30	13:00	3,5		CSOU	OK	OK	Verified line up. Pressure tested Cementing Lines 200 bar/5 min. Mixpumped 86.5 m3 1.56 sg Lead Slurry.

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						Mixpumped 15 m3 1.92 sg Tail Slurry. Released Dart and pumped Sea Water to shear Top Plug using the Cement Pump. Pumped an additional 300 l Sea Water. Switched to Rig Pumps and Pumped Sea Water to bump Plug. Bled off pressure and checked Floats.ok. Rigged down Cement Hose and released Running Tool.
31.01.2003.13:00	15:00	2,0	CTTU	OK	OK	POOH the Landing String and moved the Rig off location. Flushed the String. Had safety meeting. POOH the string and L/D the Running Tool.
31.01.2003.15:00	15:30	0,5	CTTU	OK	OK	L/D the Cement Stand.
31.01.2003.15:30	19:00	3,5	BBRU	OK	OK	Prepared to run BOP's and Riser. Started skidding BOP's from Park Position to BOP Carrier 1800 hrs. P/U 10' Riser Pup in Spider.
31.01.2003.19:00	19:30	0,5	BBOU	OK	OK	Had Safety Meeting and SJA Meeting for operations on the Cellar Deck.
31.01.2003.19:30	20:00	0,5	BBOU	OK	OK	Cleaned Rig Floor due to snow and ice.
31.01.2003.20:00	00:00	4,0	BBRU	OK	OK	M/U a Double and a PUP. Skidded BOP's to Rig Center. Connected Riser, Guide Lines and Pod Lines.
01.02.2003.00:00	02:00	2,0	BBRU	OK	OK	Cont connect Pod Lines and Riser Inclinator. P/U BOP and skidded Carrier to park position.
01.02.2003.02:00	06:00	4,0	BBRU	OK	OK	Ran BOP's and Riser. Tested K/C Lines 30/345 bar every 5 Joints.
01.02.2003.06:00	07:00	1,0	BBRU	OK	OK	Ran BOP's from 93 m to 108 m.
01.02.2003.07:00	18:00	11,0	BBRU	OK	OK	Had Pre-job meeting on the Drill Floor with day crew. Ran BOP's from 108 m to 353 m. Pressure tested K/C lines every 5'th Riser Joint, 30/345 bar. (Ran a total of 23 joints and 1 pup.).
01.02.2003.18:00	19:00	1,0	BBRU	OK	OK	Picked up the Slip Joint from Deck.
01.02.2003.19:00	22:00	3,0	BBRU	OK	OK	M/U Slip Joint. Attached Support Ring. Pressure tested Kill- and Choke Line to 30/345 bar, 5/10 min. Released Support Ring from Housing. Attached Rucker Wire nr 3, 5 and 6 to Support Ring.
01.02.2003.22:00	23:00	1,0	BBRU	OK	OK	Moved Rig to place BOP's over well center. Pulled up on Guide Wires.
01.02.2003.23:00	00:00	1,0	BBRU	OK	OK	Landed BOP's at 2310 hrs. Locked Connector and took overpull test to 25 ton. Stroked out Inner Barrel and installed RBQ Plates.
02.02.2003.00:00	02:30	2,5	BBRU	OK	OK	Continued installing Pod Hoses and RBQ Plates. Picked up and installed Diverter. Simultaneouslu tested 13.375" Casing and BOP Connector against Shear Rams 35/180 bar for 5/15 min.
02.02.2003.02:30	03:30	1,0	BBRU	OK	OK	R/D Riser Equipment and cleared the Drill Floor.
02.02.2003.03:30	05:00	1,5	BBUU	OK	OK	R/U and tested Top Drive, UIBOP and LIBOP 35/345 bar.
02.02.2003.05:00	06:00	1,0	DTBU	OK	OK	R/D Test Sub from Top Drive and R/U 5.5" Drilling Equipment.
02.02.2003.06:00	10:00	4,0	181,0	DTBU	OK	M/U and ran 8.5" Bha. P/U 9 joints 6.5" Drill Collars and Jars. Tested Stand Pipe Manifold
02.02.2003.10:00	17:00	7,0	1175,0	DTDU	OK	Ran in hole 8,5" Bha on 5,5" DP. Picked up 102 joints DP from Deck.
02.02.2003.17:00	18:00	1,0	1175,0	DTDU	OK	Function tested BOP's on Blue Pod from Drillers Panel and on Yellow Pod from Tool Pushers Panel.
02.02.2003.18:00	20:00	2,0	1175,0	RMSU	OK	Cut 200 ft. and slip 100 ft. Drill Line.
02.02.2003.20:00	22:00	2,0	1272,0	DCAU	OK	Washed down from 1134 m to 1250 m. Had choke drill with the crew. Continued wash down and tag cement at 1272 m, pumping 2100 lpm, 60 rpm.
02.02.2003.22:00	00:00	2,0	1292,0	CDDU	OK	Drilled firm cement from 1272 m 1292 m, 1-5 ton WOB, 60-100 rpm, 0-12 kNm, 1900-2520 lpm, 64-124 bar. Drilled Wiper Plug at 1275 m. Had pump pressure and torque increase several times at 1284 m indicating rubber. Worked pipe up/down several times.

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03.02.2003.00:00	01:00	1,0	1305,0	CDDU	OK	OK	Cont drilling firm cement in the Shoe Track from 1292 m to 1305 m, 0-6 ton WOB, 100 rpm, 2500 lpm, 125 bar. Changed parameters prior to drilling out of the Shoe at 1305 m to 1000 lpm, 85 bar, 60 rpm. Had no further indications of rubber in the hole. Boosted Riser 2000 lpm. Dumped returns.
03.02.2003.01:00	03:30	2,5	1314,0	DDOU	OK	OK	Washed out Rat Hole and drilled 3 m new formation to 1314 m. Pumped 20 m3 HiVisc Pill around. Spot 10 m3 HiVisc Pill on bottom prior to XLOT.
03.02.2003.03:30	05:30	2,0	1297,0	EXLU	OK	OK	Pulled back up into the Shoe and closed MPR. Prepared for LOT. Pressure tested surface lines 200 bar/5 min. Performed XLOT to 1.54 sg (Reopening pressure.)
03.02.2003.05:30	06:00	0,5	1314,0	DCAU	OK	OK	Opened MPR. RIH to TD. Pumped 20 m3 Pot Water. Pumped 10 m3 HiVisc 1.34 sg Pill followed by Glydril KCl Mud.
03.02.2003.06:00	07:30	1,5	1314,0	DCAU	OK	OK	Displaced the Hole to 1.34 sg KCl mud.
03.02.2003.07:30	15:00	7,5	1640,0	DDRU	OK	OK	Drilled and surveyed 8.5" hole from 1314 m to 1640 m, 5-10 ton WOB, 150 rpm, 2.6-10.5 kNm, 2250 lpm, 155-170 bar. Max ECD 1.57 sg. Boosted Riser using Mud Pump 1, 1500 lpm. Reamed stand once prior to making connection.
03.02.2003.15:00	15:30	0,5	1640,0	DDRU	OK	OK	Circulated and conditioned mud due to hole cleaning and high ECD.
03.02.2003.15:30	00:00	8,5	1863,0	DDRU	OK	OK	Drilled and surveyed from 1640 m to 1863 m, 5-10 ton WOB, 150 rpm, 4-14 kNm, 2550 lpm, 173-190 bar. Max ECD 1.57 sg. Boosted Riser using Mud Pump 1, 1500 lpm. Reamed stand once prior to connection. Experienced severe stick/slip between 1730 m - 1755 m. Drilled at various parameters to reduce stick/slip.
04.02.2003.00:00	06:00	6,0	2011,0	DDRU	OK	OK	Cont drilled and surveyed from 1863 m to 2011m, 1-11 ton WOB, 160 rpm, 4-14 kNm, 2500 lpm, 197 bar. Max ECD 1.60 sg. Boosted Riser using Mud Pump 1, 1500 lpm. Reamed stand once prior to connection.
04.02.2003.06:00	14:30	8,5	2140,0	DDRU	OK	OK	Drilled 8.5" hole from 2011 to 2140 m, 7-10 ton WOB, 60-160 rpm, 2.7-9.4 kNm, 2500 lpm, 200-205 bar. Boosted Riser using Mud Pump 1, over the intervals of 2011-2045 m and 2095-2140 m. ECD 1.52 - 1.59 sg. Had only minor stick/slip of Drill String over the interval.
04.02.2003.14:30	17:00	2,5	2140,0	ECSU	OK	OK	Circulated B/U for samples. Continued Circulating the Hole clean, 2500 lpm, 200 bar, 160 rpm. Boosted Riser.
04.02.2003.17:00	20:00	3,0	2140,0	DTRU	OK	OK	Flow checked 15 min ok. Pulled 5 stands wett. Slugged the Pipe. POOH to 1823 m. Had tight spots at 1900 m and over the interval 1870-1850 m. Max overpull 20 ton. Hole not taking correct amount of mud at 1823 m. Ran back to TD.
04.02.2003.20:00	21:30	1,5	2140,0	DCAU	OK	OK	Circulated B/U 2500 lpm, 185 bar. Simultaneously boosted Riser 1300 lpm. Had max 0.2% gas. Only minor amounts of soft formation over the Shakers.
04.02.2003.21:30	00:00	2,5	1750,0	DCBK	OK	OK	Flow checked. Well static. Back reamed out from TD to 1750 m, 2000 lpm, 130 bar, 120 rpm. Boosted Riser 1800 lpm.
05.02.2003.00:00	02:00	2,0	1282,0	DCBK	OK	OK	Cont back ream up into the Shoe at 1282 m, 2000 lpm, 130 bar, 120 rpm. Boosted Riser 1800 lpm.
05.02.2003.02:00	03:30	1,5	1282,0	DCAU	OK	OK	Circ. B/U 2500 lpm, 170 bar. Boosted Riser 1600 lpm. Flow checked, ok.
05.02.2003.03:30	06:00	2,5	98,0	DTRU	OK	OK	POOH. Flow checked prior to going through the BOP's, ok. Had kick drill with crew. POOH to 98 m.
05.02.2003.06:00	07:00	1,0		DTRU	OK	OK	POOH and racked back the Bha in the Derrick. L/D MWD.
05.02.2003.07:00	07:30	0,5		DEOU	OK	OK	Cleared Rig Floor.
05.02.2003.07:30	08:00	0,5		ETCU	OK	OK	Prepared core run. M/U and set back Landing Stand.
05.02.2003.08:00	08:30	0,5		ETCU	OK	OK	Had Pre-Job meeting and SJA meeting on Drill Floor.
05.02.2003.08:30	12:30	4,0		ETCU	OK	OK	P/U. M/U and ran 27 m Core Barrel.

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											Had Pre-Job meeting with new crew. Cont P/U and ran Core Barrel. P/U, ran and spaced out Inner Barrel.
05.02.2003.12:30	22:30	10,0		ETCU	OK	OK					RIH Core Barrel Assy. Broke circ. at 1000 m, 500 lpm, 18 bar. Took 10 ton weight at 2090 m. Reamed and washed down from 2090 m to TD at 2140 m, 600 lpm, 45 bar, 70 rpm, 0.3-8.4 kNm. Spaced out to cut a full Core.
05.02.2003.22:30	00:00	1,5		ERCU	OK	OK					Dropped, circulated down and landed Ball pumping 300 lpm. Cut Core from 2140 m to 2145 m, 3-12 ton WOB, 70-110 rpm, 4.5-9.5 kNm, 600 lpm, 56-76 bar.
06.02.2003.00:00	03:00	3,0		ERCU	OK	OK					Continued cut Core nr 1 from 2145 m to 2164 m, 10-14 ton WOB, 110 rpm, 5.5-13.4 kNm, 600 lpm, 67-80 bar. Core jammed at 2164 m. Pulled off bottom.
06.02.2003.03:00	05:30	2,5		ERCU	OK	OK					Circulated B/U, 1000 lpm, 102 bar, 10 rpm, 2.6 kNm. Boosted Riser 1140 lpm. Had 0.5% max gas.
06.02.2003.05:30	06:00	0,5		ETCU	OK	OK					Flow checked. ok. Started POOH the Coring Assy.
06.02.2003.06:00	15:00	9,0	30,0	ETCU	OK	OK					POOH with coring assy no.1 from 2163 m to 30 m. Flow checked at 1300 m and 690 m, OK.
06.02.2003.15:00	15:30	0,5	30,0	ETCU	OK	OK					Held SJA meeting prior to L/D inner barrels with cores.
06.02.2003.15:30	17:30	2,0		ETCU	OK	OK					L/D inner barrels with cores.
06.02.2003.17:30	18:00	0,5		ETCU	OK	OK					Cleaned and cleared rig floor.
06.02.2003.18:00	19:00	1,0		ETCU	OK	OK					Changed core head and serviced outer barrel.
06.02.2003.19:00	19:30	0,5		ETCU	OK	OK					Held SJA meeting prior to P/U and installing inner barrel.
06.02.2003.19:30	20:30	1,0		ETCU	OK	OK					Installed inner barrel and spaced out same. Checked ball seat and float.
06.02.2003.20:30	00:00	3,5	990,0	ETCU	OK	OK					RIH with coring assy no.2 (27 m core barrel) to 990 m. Filled pipe and broke circulation, 600 lpm / 5 bar.
07.02.2003.00:00	05:00	5,0	2164,0	ETCU	OK	OK					RIH with coring assy no.2 from 990 m to 2164 m. Washed down last stand, 1000 lpm / 46 bar. Took 10 ton weight at 2157 m.
07.02.2003.05:00	05:30	0,5	2164,0	ETCU	OK	OK					Racked back one stand and spaced out. Dropped ball and M/U drilling stand. Circulated ball down with 600 lpm.
07.02.2003.05:30	06:00	0,5	2164,5	ERCU	OK	OK					Cut core from 2164 m to 2164,5 m. Parameters: 8-10 ton WOB / 70 rpm / 2,7 - 10,8 kNm / 1000 lpm / 80 - 86 bar.
07.02.2003.06:00	08:00	2,0	2174,0	ERCU	OK	OK					Cut core from 2164,5 m to 2174 m. Core jammed off at 2174 m. Parameters: 1000 lpm / 80-94 bar / 10-12 ton WOB / 70-110 rpm / 2,7-24,4 kNm.
07.02.2003.08:00	10:30	2,5	2174,0	ECFU	OK	OK					Pulled off bottom and circulated bottoms up, 1000 lpm / 51 bar. Boosted riser with 1500 lpm / 100 bar. Flow checked, OK.
07.02.2003.10:30	19:00	8,5	30,0	ETCU	OK	OK					POOH with coring assy no.2 from 2174 m to 30 m. Flow checked at 1300 m and 690 m, OK.
07.02.2003.19:00	19:30	0,5	30,0	ETCU	OK	OK					Held SJA meeting prior to L/D inner barrels with cores.
07.02.2003.19:30	21:30	2,0		ETCU	OK	OK					L/D inner barrels with cores. M/U new inner barrels. Broke off core head and racked back core barrel. Cleaned and cleared rig floor.
07.02.2003.21:30	22:00	0,5		DTBU	OK	OK				< /TD>	P/U MWD. Broke off bit and M/U new bit.
07.02.2003.22:00	00:00	2,0	110,0	DTBU	OK	OK					M/U 8 1/2" BHA.
08.02.2003.00:00	01:30	1,5	440,0	DTDU	OK	E FAIL					Continued to M/U 8 1/2" BHA and RIH with same to 440 m. Stopped operations due to a bursted hydraulic hose on top drive.
08.02.2003.01:30	02:00	0,5	440,0	DERD	E FAIL	OK					Repaired hydraulic hose on top drive.
08.02.2003.02:00	03:00	1,0	875,0	DTDU	OK	OK					Continued to RIH with 8 1/2" BHA from 440 m to 875 m. Halted operations due to weather conditions, maximum heave 4,5 m. Prepared hang-off stand.
08.02.2003.03:00	05:00	2,0	875,0	DDWW	OK	HANG					Waited on weather. Increasing heave trend. maximum

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08.02.2003.05:00	06:00	1,0	1255,0	DDWW	HANG	OK	heave 7 m. Prepared for hanging off drill string.
08.02.2003.06:00	09:00	3,0	1255,0	DDWW	OK	OK	M/U hang-off stand and RIH. Positioned hang-off tool 10 m above BOP and stood stand by for hanging off.
08.02.2003.09:00	10:30	1,5	905,0	DTDU	OK	OK	Waiting on weather with hang off tool positioned 10 m above BOP, stby for hanging off. Meanwhile performed general rig maintenance.
08.02.2003.10:30	13:00	2,5	2174,0	DTDU	OK	OK	POOH with hang-off stand and racked back same.
08.02.2003.13:00	19:30	6,5	2212,0	DDRU	OK	OK	Tested MWD and RIH from 905 m to 2174 m. Reamed through tight spot at 2080 m, took 20 ton weight. Washed and reamed down from 2108 m to 2174 m. Logged cored interval from 2140 m.
08.02.2003.19:30	21:00	1,5	2212,0	DCAU	OK	OK	Drilled 8 1/2" hole from 2174 m to 2212 m. Got drilling break at 2210 m. Parameters: 2500 lpm / 200 bar / 3-12 ton WOB / 160 rpm / 3-16 kNm / ECD 1,49-1,57 sg.
08.02.2003.21:00	21:30	0,5	2189,0	DCRK	OK	OK	Flow checked, OK. Circulated bottoms up for samples. Max gas 0,3 %. Resiprocated string while circulating. Took 10-15 ton weight at 2189 m.
08.02.2003.21:30	00:00	2,5	2252,0	DDRU	OK	OK	Washed and reamed through tight spot at 2189 m.
09.02.2003.00:00	02:30	2,5	2307,0	DDRU	OK	OK	Drilled 8 1/2" hole from 2252 m to 2307 m. Drilling break at 2305 m. Parameters: 2500 lpm / 200-205 bar / 5-10 ton WOB / 160 rpm / 3-17 kNm / ECD 1,49-1,51 sg.
09.02.2003.02:30	03:00	0,5	2307,0	DDRU	OK	OK	Flow checked, OK. Re-logged interval from 2296 m to 2307 m due to poor MWD data.
09.02.2003.03:00	06:00	3,0	2373,0	DDRU	OK	OK	Drilled 8 1/2" hole from 2307 m to 2373 m. Parameters: 2500 lpm / 200-215 bar / 5-10 ton WOB / 160 rpm / 5-8 kNm / ECD 1,50-1,53 sg.
09.02.2003.06:00	07:00	1,0	2400,0	DDRU	OK	OK	Drilled 8 1/2" hole from 2373 m to TD at 2400 m. Parameters: 2500 lpm / 210 bar / 5-10 ton WOB / 160 rpm / 5-8 kNm / ECD 1,53 sg.
09.02.2003.07:00	09:00	2,0	2400,0	DCAU	OK	OK	Circulated bottoms up, 2550 lpm/ 180 bar.
09.02.2003.09:00	12:30	3,5	2065,0	DTLU	OK	OK	Back reamed out of hole from 2400 m to 2065 m, 1500 lpm / 95 bar / 10-90 rpm. Tight hole from 2395 m to 2120 m, 5-25 ton over pull.
09.02.2003.12:30	14:30	2,0	2065,0	DCAU	OK	OK	Circulated well clean, 2550 lpm / 180 bar.
09.02.2003.14:30	20:30	6,0		DTLU	OK	OK	POOH with 8 1/2" BHA. L/D MWD.
09.02.2003.20:30	21:30	1,0		DDOU	OK	OK	Broke out and L/D coring assy.
09.02.2003.21:30	23:00	1,5		DDOU	OK	OK	Cleaned and cleared rig floor. L/D excess equipment. R/U for handling 3 1/2" DP.
09.02.2003.23:00	00:00	1,0	150,0	DDOU	OK	OK	P/U 16 jts of 3 1/2" DP from deck and RIH with same.
10.02.2003.00:00	01:30	1,5	260,0	DDOU	OK	OK	P/U 11 jts (27 in total) of 3 1/2" DP and RIH. POOH and racked back 3 1/2" DP.
10.02.2003.01:30	04:00	2,5		ELOU	OK	OK	R/U for wire line logging. Held pre job meeting prior to picking up logging tools and installing radioactive sources.
10.02.2003.04:00	04:30	0,5		ELOU	OK	OK	Picked up tool string no. 1 (PEX-HALS-HNGS). Installed radioactive sources.
10.02.2003.04:30	06:00	1,5	2150,0	ELOU	OK	OK	RIH with tool string no.1 on wire line. Performed down log to 2150 m.
10.02.2003.06:00	09:30	3,5		ELOU	OK	OK	Completed logging run no. 1 (PEX-HALS-HNGS), POOH.
10.02.2003.09:30	11:30	2,0		ELOU	OK	OK	L/D tool string no.1 and removed radioactive sources. P/U tool string no. 2 (VSP).
10.02.2003.11:30	18:30	7,0		ELOU	OK	OK	RIH with VSP on wire line and performed logging run no. 2. POOH.
10.02.2003.18:30	20:30	2,0		ELOU	OK	OK	L/D tool string no.2. P/U tool string no.3 (FMI-DSI).
10.02.2003.20:30	00:00	3,5	2385,0	ELOU	OK	OK	RIH with FMI-DSI on wire line and performed down log to

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							2385 m.
11.02.2003.00:00	05:00	5,0	592,0	ELOU	OK	OK	Performed main up log from 2385 m to 592 m.
11.02.2003.05:00	06:00	1,0		ELOU	OK	OK	POOH and L/D tool string no. 3.
11.02.2003.06:00	07:00	1,0		ELOU	OK	OK	P/U tool string no. 4 (MDT, for pressure points).
11.02.2003.07:00	07:30	0,5		ELOU	OK	OK	Held SJA meeting prior to MDT logging.
11.02.2003.07:30	17:00	9,5		ELOU	OK	OK	RIH with MDT, logging run no. 4. Collected 27 pressure points from 1743 m to 2343 m, POOH.
11.02.2003.17:00	20:30	3,5		ELOU	OK	OK	L/D tool string no. 4 and P/U tool string no. 5 (MDT dual packer for fluid sampling and mini DST).
11.02.2003.20:30	00:00	3,5	2169,0	ELOU	OK	OK	RIH with MDT, logging run no. 5. Correlated depth and commenced fluid sampling at 2169 m.
12.02.2003.00:00	03:30	3,5	2169,0	ELOU	OK	OK	Collected 3 x 450 cc and 1 gallon sample chamber.
12.02.2003.03:30	05:00	1,5	2169,0	ELOU	OK	OK	Performed mini DST.
12.02.2003.05:00	05:30	0,5	2169,0	ELOU	OK	OK	Deflated packer elements and pulled free, no overpull.
12.02.2003.05:30	06:00	0,5	2150,0	ELOU	OK	OK	Picked up and correlated depth at second sampling level. Commenced fluid sampling at 2150 m.
12.02.2003.06:00	09:30	3,5	2150,0	ELOU	OK	OK	Inflated packer elements and started clean up sequence for sampling at 2150 m.
12.02.2003.09:30	12:30	3,0	2150,0	ELOU	OK	OK	Performed mini DST and collected 3 x 450 cc and 1 gallon sample chamber.
12.02.2003.12:30	13:00	0,5	2150,0	ELOU	OK	OK	Deflated packer elements and pulled free, no overpull.
12.02.2003.13:00	13:30	0,5	2142,0	ELOU	OK	E FAIL	P/U and correlated depth at third sampling level. Commenced clean up sequence for mini DST at 2142 m. Experienced problems with the pump.
12.02.2003.13:30	14:00	0,5	2142,0	ELOD	E FAIL	OK	Trouble shot plugging in the pump.
12.02.2003.14:00	16:00	2,0	2142,0	ELOU	OK	OK	Performed mini DST at 2142 m.
12.02.2003.16:00	16:30	0,5	2142,0	ELOU	OK	OK	Deflated packer elements and pulled free, no overpull.
12.02.2003.16:30	20:00	3,5		ELOU	OK	OK	POOH and L/D toolstring no. 5 (MDT dual packer).
12.02.2003.20:00	21:00	1,0		ELOU	OK	E FAIL	Prepared for running tool string no. 6 (CST, Side wall cores).
12.02.2003.21:00	22:00	1,0		ELOD	E FAIL	OK	Discovered failure in cable collector, repaired same.
12.02.2003.22:00	22:30	0,5		ELOU	OK	OK	Held SJA meeting prior to P/U CST. Called radio silence and shut down satellite communication.
12.02.2003.22:30	00:00	1,5		ELCU	OK	OK	P/U CST and armed same. RIH to 70 m below sea bed and powered up unit. Lifted radio silence and connected satellite communication.
13.02.2003.00:00	01:30	1,5	2380,0	ELCU	OK	OK	RIH with CST to 2380 m.
13.02.2003.01:30	03:00	1,5	2320,0	ELCU	OK	E FAIL	Correlated depth and started to collect side wall cores. Fired 8 bullets from 2370 m to 2319 m. Detected shortcut while firing bullet #8.
13.02.2003.03:00	04:30	1,5	2320,0	ELOD	E FAIL	OK	Trouble shot and changed surface electronics. Ran back in and re-correlated depth.
13.02.2003.04:30	06:00	1,5	2261,0	ELCU	OK	OK	Continued collecting side wall cores. Fired 6 bullets from 2318 m to 2261 m.
13.02.2003.06:00	07:00	1,0	2223,0	ELCU	OK	E FAIL	Collected side wall cores. Fired 8 bullets from 2261 m to 2228 m. Unable to fire bullet #23 at 2223 m due to software problems.
13.02.2003.07:00	09:00	2,0	2223,0	ELOD	E FAIL	OK	Trouble shot problem. Changed two circuit boards in the power distribution panel.
13.02.2003.09:00	11:00	2,0	1712,0	ELCU	OK	OK	Continued to collect side wall cores. Fired 37 bullets from 2223 m to 1712 m.
13.02.2003.11:00	12:00	1,0	500,0	ELCU	OK	OK	POOH with CST to 70 m below sea bed. Initiated radio silence and shut down satellite communication.
13.02.2003.12:00	13:30	1,5		ELCU	OK	OK	POOH and L/D tool string no.6 (CST). Recovered 47 cores, lost 5 and 7 empty. No misfires. Lifted radio silence.

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13.02.2003.13:30	17:00	3,5	296,0	PTTU	OK	E FAIL	M/U and RIH with mule-shoe and 9 stand of 3 1/2" cement stinger to 296 m.
13.02.2003.17:00	18:00	1,0	296,0	DERD	E FAIL	OK	Repaired broken hydraulic hose on upper racking arm.
13.02.2003.18:00	23:00	5,0	2400,0	PTTU	OK	OK	Continued to RIH with 3 1/2" cement stinger on 5 1/2" DP to 2400 m. Washed down last 3 stands.
13.02.2003.23:00	00:00	1,0	2400,0	PCCU	OK	OK	Circulated bottoms up while reciprocating string, 2500 lpm/146 bar. Meanwhile held pre job safety meeting prior to cement job.
14.02.2003.00:00	00:30	0,5	2400,0	PAOU	OK	OK	M/U cement stand and hooked up cement hose. Pressure tested lines, 200 bar/ 5 min.
14.02.2003.00:30	01:30	1,0	2400,0	PSSU	OK	OK	Pumped 5,8 m3 of 1,62 sg spacer. Mixed and pumped 9,7 m3 of 1,9 sg cement slurry. Displaced same with 23,7 m3 of 1,34 sg mud.
14.02.2003.01:30	03:00	1,5	2150,0	PTTU	OK	OK	Racked back cement stand and POOH to 2150 m.
14.02.2003.03:00	04:30	1,5	2150,0	PCCU	OK	OK	Circulated bottoms up, 2500 lpm/ 143 bar. Rotated and reciprocated string while circulating.
14.02.2003.04:30	05:00	0,5	2150,0	PAOU	OK	OK	M/U cement stand and hooked up cement hose. Pressure tested lines, 200 bar/ 5 min.
14.02.2003.05:00	06:00	1,0	2150,0	PSSU	OK	OK	Pumped 5,0 m3 of 1,62 sg spacer. Mixed and pumped 9,7 m3 of 1,9 sg cement slurry.
14.02.2003.06:00	06:30	0,5	2150,0	PSSU	OK	OK	Displaced cement with 20,0 m3 1,34 sg WBM.
14.02.2003.06:30	08:30	2,0	1700,0	PTTU	OK	OK	Racked back cement stand and POOH from 2150 m to 1700 m.
14.02.2003.08:30	09:30	1,0	1700,0	PCCU	OK	OK	Dropped wash ball and circulated bottom up: Parameters: 2500 lpm, 50 rpm, 130 bar.
14.02.2003.09:30	11:30	2,0	1460,0	PTTU	OK	OK	POOH from 1700 m to 1463 m. Installed Perigon cement support tool, pumped 1500 lpm.
14.02.2003.11:30	12:00	0,5	1450,0	PAOU	OK	OK	Made up cement stand and hooked up cement hose. Pressure tested cement lines to 200 bar / 5 min.
14.02.2003.12:00	14:30	2,5	1000,0	PSSU	OK	OK	Pumped 8,0 m3 1,62 spacer. Mixed and pumped 16,5 m3 1,92 sg cement slurry. Displaced cement with 12,0 m3 of 1,34 sg WBM. Racked back cement stand and POOH from 1450 m to 1000 m.
14.02.2003.14:30	15:30	1,0	1000,0	PCCU	OK	OK	Dropped wash ball and circulated bottoms up. Parameters: 2500 lpm, 50 rpm, 105 bar. No cement in return.
14.02.2003.15:30	22:30	7,0	,0	PTTU	OK	E FAIL	Pumped slug and POOH, laid down 75 jnts 5 1/2" DP on way out.
14.02.2003.22:30	00:00	1,5		PAOD	E FAIL	OK	Performed pre-job meeting and SJA prior to change wire on intermediat racking arm, IRA. Changed wire on IRA.
15.02.2003.00:00	01:00	1,0		PAOD	E FAIL	OK	Changed and tested wire on IRA. Meanwhile prepare to pressuretest cementplug.
15.02.2003.01:00	01:30	0,5		PSTU	OK	OK	Pressuretested cement plug to 122 bar / 10 min by pumping 370 litre 1,34 sg WBM.
15.02.2003.01:30	06:00	4,5	655,0	PSMU	OK	OK	Performed pre-job meeting. MU RT and 13 3/8" EZSV to 3 1/2" DP. RIH with EZSV and set same at 655 m. Pressuretested EZSV to 139 bar / 10 min by pumping 270 litre 1,34 sg WBM.
15.02.2003.06:00	07:30	1,5	655,0	PCCU	OK	OK	Displaced well to sea water. Displaced K/C lines, booster line, and choke through poor boy.
15.02.2003.07:30	12:00	4,5	,0	PTPU	OK	OK	POOH. Laid down 5 1/2" DP while pulling out. Changed to 3 1/2" equipment and laid down 3 1/2" DP. BO and laid down EZSV RT. Changed to 5 1/2" equipment.
15.02.2003.12:00	14:30	2,5	655,0	PTTU	OK	OK	PU wear bushing RT and jet sub. Made up same and RIH. Pulled WB free with 20 ton overpull.
15.02.2003.14:30	17:30	3,0	,0	PTPU	OK	OK	POOH. LD 5 1/2" DP while pulling out. Released WB from running tool, broke out and LD running tool and jet sub.
15.02.2003.17:30	18:30	1,0	,0	PTPU	OK	OK	Broke out and LD hang off stand.

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15.02.2003.18:30	00:00	5,5	,0	PTPU	OK	OK	Broke out and LD 11 jnts 8" DC, 8" jar and 12 jnts 6 1/2" DC.
16.02.2003.00:00	00:30	0,5	,0	PTPU	OK	OK	Continued to LD 6 1/2" DC.
16.02.2003.00:30	06:00	5,5	,0	PTPU	OK	OK	Broke out and LD 11 jnts 5 1/2" HWDP, 1 ea 6 1/2" jar and 36 jnts 5 1/2" DP.
16.02.2003.06:00	07:30	1,5	,0	PTPU	OK	OK	Broke out and laid down 9 jnts 5" ITAG DP.
16.02.2003.07:30	08:30	1,0	,0	PTPU	OK	OK	Laid down excess drilling equipment, x-overs slips etc.
16.02.2003.08:30	11:00	2,5	,0	PTPU	OK	OK	Cleaned and cleared rig floor. RD BX elevator and drilling bails. Installed 500 ton bails and elevator. Installed diverter RT.
16.02.2003.11:00	00:00	13,0	,0	PAWW	OK	OK	WOW. Performed general rig maintenance.
17.02.2003.00:00	06:00	6,0	,0	PAWW	OK	OK	WOW. Performed general rig maintenance.
17.02.2003.06:00	00:00	18,0		PAWW	OK	OK	WOW. Performed general rig maintenance.
18.02.2003.00:00	06:00	6,0		PAWW	OK	OK	WOW. Performed general rig maintenance.
18.02.2003.06:00	15:30	9,5		PAWW	OK	OK	WOW. Performed general rig maintenance.
18.02.2003.15:30	18:00	2,5		BBRU	OK	OK	Pulled out Diverter, L / D same. Picked up slipjnt R / T from derrick.
18.02.2003.18:00	19:30	1,5		BBRU	OK	OK	Collapsed innerbarrel, locked dogs. Disconnected BOP. Disconnected guide posts with ROV.
18.02.2003.19:30	20:00	0,5		BBRU	OK	OK	Moved rig 30 m to starboard. Meanwhile held pre job and SJA meeting prior to pull BOP.
18.02.2003.20:00	23:00	3,0		BBRU	OK	OK	Locked supportring to diverter housing and secured same. Pulled and L/D slip jnt to deck.
18.02.2003.23:00	00:00	1,0		BBRU	OK	OK	Pulled riser/ BOP from 375 to 323 m.
19.02.2003.00:00	06:00	6,0		BBRU	OK	OK	Pulled riser / BOP. BOP out of water at 05:48 hrs.
19.02.2003.06:00	08:30	2,5		BBRU	OK	OK	Nippled down BOP. Deballasted Rig 1,5 m.
19.02.2003.08:30	12:00	3,5		BBRU	OK	OK	Secured BOP on carrier. Had pre-job meeting. Disconnected riser at 08:55 hrs. Skidded BOP to parking position. L / D 2 riser joints and one pup.
19.02.2003.12:00	14:00	2,0		BBNU	OK	OK	Laid down BOP handling equipment. Installed drilling bails and Bx elevator.
19.02.2003.14:00	17:30	3,5		PAOU	OK	OK	Made up pad eye sub and ROV hook with wire sling to 5 1/2" DP. Connected ROV hook to trawl cap. in water at 15:45 hrs. Positioned rig and landed trawl cap on well head at 17:10 hrs. Disconnected ROV hook from trawl cap.
19.02.2003.17:30	18:30	1,0		PAOU	OK	OK	Positioned rig over ROV basket Hooked on to same.
19.02.2003.18:30	21:30	3,0		PTPU	OK	OK	L / D 45 jnts DP on way out. Landen ROV basket on trolley.
19.02.2003.21:30	23:00	1,5		RMMU	OK	OK	Backloaded DP and guide posts to Skandi Stolmen. Lifted ROV from ROV moonpool and placed same on starboard boxgirder.
19.02.2003.23:00	00:00	1,0		MNBU	OK	OK	Started ballasting rig at 22:45hrs. (Started anchor handling.) 23:05 hrs Pennat # 3 to Northern Admiral. 23:10 hrs Pennat # 7 to Asso 22. 23:15 hrs Pennat # 4 to Pacific Banner.
20.02.2003.00:00	06:00	6,0		MARU	OK	OK	Anchor # 3 off bottom at 00:45. On deck at 02: 20 hrs disconnected at 03:35. Anchor # 4 off bottom at 00:20 On bolster at 03:15. Anchor # 7 off bottom at 00:35 On bolster at 06:00 03:45 hrs Pennat # 5 to Northern Admiral. Off bottom at 04:40. 03:55 hrs Pennat # 8 to Pacific Banner. Off bottom at 04:40.
20.02.2003.06:00	14:00	8,0		MARU	OK	OK	Anchor # 8 off bottom at 04:40 hrs. On bolster at 07: 50 hrs. Anchor # 5 off bottom at 04:40 hrs. On bolster at 08:25hrs. Anchor # 9 off bottom at 09:10 hrs. On deck, changed fluke angle to 32°. Connected tow wire. Pacific Banner ready for tow at 12:30hrs.

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Anchor # 6 off bottom at 12:55 hrs. On bolster at 13:55.
Northern Admiral ready to tow on anchor chain # 2 at
14:00 hrs.
End of 6608/10-9 operation (Lerke) AT 14:00 hrs.
Distance to sail 497 nm.

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App B Directional data, survey listing

Wellbore		
Name	Created	Last Revised
6608/10-9	28-Feb-2003	16-May-2003

Well		
Name	Government ID	Last Revised
6608/10-9		27-Feb-2003

Slot						
Name	Grid Northing	Grid Easting	Latitude	Longitude	North	East
6608/10-9	7327254.4493	464778.9362	N66 3 44,1500	E8 13 19,5700	4118,01N	6114,25E

Installation				
Name	Easting	Northing	Coord System Name	North Alignment
6608/10 Exploration	458666,999	7323138,001	ED50-UTM-32N on EUROPEAN DATUM 1950 datum	Grid

Field				
Name	Easting	Northing	Coord System Name	North Alignment
EXPLORATION - UTM Zone 32	500000,000	7208634,841	ED50-UTM-32N on EUROPEAN DATUM 1950 datum	Grid

Created By

Comments

All data is in Metres unless otherwise stated
 Coordinates are from Installation MD's are from Rig and TVD's are from Rig (Deepsea Bergen 23.0m above Mean Sea Level)
 Vertical Section is from 4118,01N 6114,25E on azimuth 106,15 degrees
 Bottom hole distance is 16,04 Metres on azimuth 97,90 degrees from Wellhead
 Calculation method uses Minimum Curvature method
 Prepared by Statoil

Wellpath Report							
MD[m]	Inc[deg]	Dir[deg]	TVD[m]	North[m]	East[m]	Doqleg [deg/30m]	Vertical Section[m]
400,00	0,00	0,00	400,00	4118,01N	6114,25E	0,00	0,00
470,70	0,32	251,25	470,70	4117,95N	6114,07E	0,14	-0,16
486,40	0,56	287,76	486,40	4117,95N	6113,95E	0,68	-0,27
498,70	0,63	206,75	498,70	4117,91N	6113,86E	1,89	-0,35
514,90	0,62	201,93	514,90	4117,75N	6113,79E	0,10	-0,37
527,50	0,67	194,44	527,50	4117,62N	6113,75E	0,23	-0,38
543,30	0,71	182,23	543,30	4117,43N	6113,72E	0,29	-0,35
558,00	0,74	174,95	558,00	4117,24N	6113,73E	0,20	-0,29
587,80	0,72	162,73	587,79	4116,87N	6113,80E	0,16	-0,12
615,20	0,52	165,67	615,19	4116,59N	6113,88E	0,22	0,04
644,90	0,53	165,71	644,89	4116,33N	6113,95E	0,01	0,17
702,80	0,49	123,58	702,79	4115,93N	6114,22E	0,19	0,55
788,80	0,28	340,49	788,79	4115,92N	6114,46E	0,26	0,77
876,10	0,17	19,91	876,09	4116,25N	6114,43E	0,06	0,66
963,80	0,22	41,49	963,78	4116,49N	6114,59E	0,03	0,74
1050,80	0,37	30,04	1050,78	4116,86N	6114,84E	0,06	0,88
1138,00	0,61	7,40	1137,98	4117,57N	6115,04E	0,10	0,87
1224,00	0,59	129,45	1223,98	4117,74N	6115,44E	0,37	1,21
1298,70	0,41	87,76	1298,68	4117,51N	6116,00E	0,16	1,82
1344,90	0,37	92,75	1344,88	4117,51N	6116,32E	0,03	2,12
1432,00	0,58	79,21	1431,97	4117,57N	6117,03E	0,08	2,79
1517,90	0,44	76,36	1517,87	4117,73N	6117,78E	0,05	3,46
1612,00	0,61	86,13	1611,96	4117,85N	6118,63E	0,06	4,25
1692,10	0,56	74,98	1692,06	4117,98N	6119,43E	0,05	4,98
1778,90	0,59	118,48	1778,86	4117,88N	6120,23E	0,15	5,78
1866,10	0,36	98,32	1866,05	4117,63N	6120,90E	0,10	6,49
1952,90	0,79	87,29	1952,85	4117,61N	6121,77E	0,15	7,33
2040,40	1,09	116,51	2040,34	4117,27N	6123,11E	0,19	8,72
2127,10	1,23	99,47	2127,02	4116,75N	6124,77E	0,13	10,45
2202,20	1,16	98,14	2202,10	4116,51N	6126,32E	0,03	12,01
2232,40	1,01	101,51	2232,30	4116,41N	6126,88E	0,16	12,57
2321,30	1,17	101,23	2321,18	4116,08N	6128,54E	0,05	14,26
2393,60	1,19	98,62	2393,47	4115,82N	6130,01E	0,02	15,74
2400,00	1,19	98,62	2399,86	4115,81N	6130,14E	0,00	15,87

All data is in Metres unless otherwise stated
Coordinates are from Installation MD's are from Rig and TVD's are from Rig (Deepsea Bergen 23.0m above Mean Sea Level)
Vertical Section is from 4118,01N 6114,25E on azimuth 106,15 degrees
Bottom hole distance is 16,04 Metres on azimuth 97,90 degrees from Wellhead
Calculation method uses Minimum Curvature method
Prepared by Statoil

Hole Sections									
Diameter [in]	Start MD[m]	Start TVD[m]	Start North[m]	Start East[m]	End MD[m]	End TVD[m]	End North[m]	Start East[m]	Wellbore
36,000	400,00	400,00	4118,01N	6114,25E	460,50	460,50	4117,96N	6114,12E	6608/10-9
17 1/2	460,50	460,50	4117,96N	6114,12E	1311,00	1310,98	4117,51N	6116,09E	6608/10-9
8 1/2	1311,00	1310,98	4117,51N	6116,09E	2400,00	2399,86	4115,81N	6130,14E	6608/10-9

Casings									
Name	Top MD[m]	Top TVD[m]	Top North[m]	Top East[m]	Shoe MD[m]	Shoe TVD[m]	Shoe North[m]	Shoe East[m]	Wellbore
30,000in Conductor	400,00	400,00	4118,01N	6114,25E	458,50	458,50	4117,97N	6114,13E	6608/10-9
13 3/8in Casing	400,00	400,00	4118,01N	6114,25E	1305,00	1305,00	4117,51N	6116,05E	6608/10-9

All data is in Metres unless otherwise stated
Coordinates are from Installation MD's are from Rig and TVD's are from Rig (Deepsea Bergen 23.0m above Mean Sea Level)
Vertical Section is from 4118,01N 6114,25E on azimuth 106,15 degrees
Bottom hole distance is 16,04 Metres on azimuth 97,90 degrees from Wellhead
Calculation method uses Minimum Curvature method
Prepared by Statoil

App C Contractors list

Service	Company	Telephone main office
Casing/ Liner hanger	Odfjell Casing Services	51 64 71 80
Cementing	Halliburton AS	51 83 70 00
Coring	Security DBS, Halliburton AS	51 83 70 00
Directional drilling	Baker Hughes INTEQ	51 71 75 00
Helicopters	Norsk Helikopter AS	51 64 66 00
	Helikopter Service AS	51 94 10 00
Diving	Oceaneering AS	51 82 51 00
Drilling contractor	Odfjell Drilling Services A.S	51 64 71 80
Electric logging	Schlumberger Offshore Service NV	51 69 50 00
Helicopter booking	Lufttransport (Statoil)	55 14 39 10
Mud	Anchor/M-I Drilling Fluids AS	51 57 73 00
Mud logging	Halliburton (Sperry Sun)	51 83 70 00
MWD	Baker Hughes INTEQ	51 71 75 00
Rig positioning	Thales Survey	55 34 94 00
Site survey	Fugro Survey AS	22 13 46 00
Wellhead system	ABB Offshore System AS	51 63 44 00

**Final Well Report
PL 128
Well 6608/10-9**

Doc. No.
03D94*5880
Date
2003-07-02



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App D Wellsite sample description

WELLSITE SAMPLE DESCRIPTION			Page 1 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB: 23 meters	Geologist: O.Beyer / O.Hunnes		
Hole size: 8 1/2 "	Cut solvent: Isopropanol		Date: 03.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
1320	100	Lith: gran of qtz, fldsp and mafic min from boulders	Contamin of Cmt
1330	50 50 tr	Sd/Slt: clr – transl qtz, min fldsp, slt – f, tr med-crs, lse, float in Cly Cly: med grn gry, sft, amor, slily calc Lith frgs	No shows
1340	50 50 tr	Sd/Slt: a.a. Cly: a.a. Lith frgs	a.a.
1350	50 50 tr	Sd/Slt: a.a. Cly: a.a. Lith frgs	a.a.
1360	30 70 tr	Sd/Slt: a.a. Cly: a.a. Lith frgs	a.a.
1370	20 80 tr	Sd/Slt: a.a. Cly: a.a. Lith frgs, Ls: off wh, frm, blk, cryptoxln mikr	a.a.
1380	5 95	Sd/Slt: a.a. Cly: a.a.	a.a.
1390	30 70 tr	Sd/Slt: bec gen v. aren v/lith frgs Cly: a.a. Lith frgs	a.a.
1400	30 70 tr	Sd/Slt: a.a. Cly: a.a. Lith frgs	a.a.
1410	30 70 tr	Sd/Slt: a.a. Cly: a.a. Lith frgs	a.a.
1420	20 80 tr	Sd/Slt: a.a. Cly: a.a. Ls, lith frgs	a.a.
1430	20 80 tr	Sd/Slt: a.a. Cly: a.a. Ls, lith frgs	a.a.
1440/50	Not recovered		
1460	100	Cly: bec olv gry, slily earthy, aren, loc lam v.abd glauc	a.a.
1470	100	Cly/Clst: pred olv gry – dk grnsh gry, i/p slily frm lam, sbblky, aren, abd glauc	a.a.

WELLSITE SAMPLE DESCRIPTION			Page 2 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB:	23 meters	Geologist: O.Beyer / O.Hunnes	
Hole size:	8 1/2 "	Cut solvent: Isopropanol	Date: 03.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
1480	100	Cly/Clst:pred olv gry – dk grnsh gry, sft - slily frm lam, sbblky, aren, earthy, abd glauc	No Shows
1490	100	Cly/Clst: a.a.	a.a.
1500	Not recovered		
1510	100	Cly/Clst:pred olv gry – brnsh gry, sft - slily frm lam, amor -sbblky, aren, earthy, abd glauc	a.a.
1520	100	Cly/Clst: a.a.	a.a.
1530	Not recovered		
1540	100	Cly/Clst: slty and earthy, pred sft, stky	a.a.
1550	100	Cly/Clst: a.a.	a.a.
1560	100	Cly/Clst: bec incr hydr, loc v. stky, else pred a.a.	a.a.
1570	100	Cly/Clst: a.a.	a.a.
1580	100	Cly/Clst: a.a.	a.a.
1590	100	Cly/Clst: a.a.	a.a.
1600	100	Cly/Clst: v. abn blk glauc, v.earthy app, a.a.	a.a.
1610	100	Cly/Clst: pred a.a., bec tr med – dk grnsh gry, v. glauc, less earthy Clst	a.a.
1620	100	Cly/Clst: pred med – dk grnsh gry, blsh gry, sbblky, sft-frm, loc bec tuffac, glauc, non calc	a.a.
1630	100	Cly/Clst: pred med grnsh gry, bluish gry, loc slily tuffac, v. glauc	a.a.
1640	95 5	Cly/Clst: pred med grnsh gry, bluish gry, a.a. Tuffac Clst/Tuff: med gry, blk, frm, ptchy glauc	a.a.
1640	95 5	Cly/Clst: pred med grnsh gry, blsh gry, a.a. Tuffac Clst/Tuff: med gry, blk, frm, ptchy glauc	a.a.
1650	90 10	Cly/Clst: pred a.a. Tuffac Clst/Tuff: a.a.	a.a.
1660	90 10	Cly/Clst: pred a.a. Tuff: med grn, blk microspks, frm, blk	a.a.
1670	80 20	Cly/Tuffac Clst: pred bec tuffac, else a.a. Tuff: pred a.a.	a.a.
1680	90 10	Cly/Clst: pred a.a. Tuff: pred a.a.	a.a.

WELLSITE SAMPLE DESCRIPTION			Page 3 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB: 23 meters	Geologist: O.Beyer / O.Hunnes		
Hole size: 8 1/2 "	Cut solvent: Isopropanol		Date: 03.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
1690	45	Cly/Clst: pred olv gry – dk brnsh gry, blk, frm, non calc	No Shows
	50	Tuffac Clst: med gry, blk, frm, ptchy glauc	
	5	Tuff: med gry, blk, frm, argil, blk microspks	
1700	85	Cly/Clst: pred olv gry, a.a.	a.a.
	10	Tuffac Clst/Tuff: pred a.a.	
	5	Tuff: med gry, a.a.	
1710	85	Cly/Clst: pred olv gry, a.a.	a.a.
	10	Tuffac Clst/Tuff: pred a.a.	
	5	Tuff: med gry, a.a.	
1720	70	Cly/Clst: pred olv gry, a.a.	a.a.
	20	Tuffac Clst/Tuff: gry, lt brn – olv brn, blk, frm	
	10	Tuff: med gry, a.a.	a.a.
1730	70	Clst: a.a., also mod gn, blk, frm, sli tr micropyr, non calc,	
	30	Tuff Clst: med gry – olv gry, spkld, else a.a.	
	Tr	Ls: lt gry – olv gry, frm-brt, sl arg	
1740	100	Clst: a.a.	a.a.
	Tr	Tf Clst: a.a.	
1750	100	Clst: 50 % olv gry – dk brn gry, a.a., 50 % mod gn, pale gn, a.a.	a.a.
	Tr	Ls: a.a	
1760	100	Clst: pred mod gn – pl gn type, else a.a.	a.a.
	Tr	Ls, Pyr, Sd grns, qtz, lse grns	
1770	100	Clst: a.a.	a.a.
	Tr	Ls: a.a	
1780	a.a.		a.a.
1783	90	Clst: dk gry – olv gry, occ brn gry, frm, blk, sli silty, non calc	a.a.
	10	Ls: lt gry – off wh, olv gry, blk, frm-brt, sli arg, sl sdy	
	Sl Tr	Tf Clst: a.a.	
1786	100	Clst: a.a.	a.a.
	Gd Tr	Ls: a.a.	
1789	a.a.		a.a.
1792	a.a.		a.a.
1795	a.a.		a.a.
1798	a.a.		a.a.
1801	a.a.		a.a.

WELLSITE SAMPLE DESCRIPTION			Page 4 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB:	23 meters	Geologist: O.Beyer / O.Hunnes	
Hole size:	8 1/2 "	Cut solvent: Isopropanol	Date: 03.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
1804 -13	100	Clst: dk gry – olv gry, occ brn gry, frm, blk, sli silty, non calc	No shows
1816	100 Tr	Clst: a.a. Sst; lse grns, pyr, xln, glauc	a.a.
1819	90 5 Tr	Clst: a.a. Sd: qtz, clr-trnsl, vf –f, all lse 5 Ls: lt gry – off wh, olv gry, blk, frm-brt, sli arg, sl sdy pyr	Spty dull yel fluor (min fluor?). No cut off wh – lt gry, frm, sl arg
1821	100 Tr	Clst: a.a. sd, pyr, ls	No shows
1825	100 Gd Tr	Clst: olv gry, frm, mass, bec more stky, slty, i/p gd tr pyr, non calc Ls: a.a.	a.a.
1830	100 Tr	Clst: a.a. a.a.	a.a.
1840	100 Tr Tr	Clst: a.a., also v sdy i/p., v sticky Ls: a.a. pyr; microxln & xln	a.a.
1850	a.a.		a.a.
1860	a.a.		a.a.
1870	a.a.		a.a.
1880	a.a.		a.a.
1890	a.a.		a.a.
1900	a.a.		a.a.
1910	a.a.		a.a.
1920	a.a.		a.a.
1930	a.a.		a.a.
1940	90 10	Clst: a.a., bec frm from 1940 m Ls: a.a.	a.a.
1950	90 10 Tr	Clst: a.a. Ls: a.a. pyr	a.a.

WELLSITE SAMPLE DESCRIPTION			Page 5 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB:	23 meters	Geologist: O.Beyer / O.Hunnes	
Hole size: 8 1/2 "		Cut solvent: Isopropanol	Date: 04.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
1960	90 10 Tr	Clst: olv gry, frm, mass, bec more stky, slty, i/p gd tr pyr, non calc Ls: lt gry – off wh, olv gry, blk, frm-brt, sli arg, sli sdy, dom mikr Sd: qtz, pred f-med, sbang, mod srt, all lse	No shows
1970	80 20 Tr	Clst: a.a. Ls: a.a. Sd: a.a.	a.a.
1980	90 10 Tr	Clst: a.a. Ls: a.a. Sd, Pyr	a.a.
1990	70 30 Tr	Clst: a.a. Ls: a.a. Sd, Pyr	a.a.
2000	70 30 Tr	Clst: v. aren a.a. Ls: a.a. Sd, Pyr	a.a.
2010	80 20 Tr	Clst: a.a. Ls: a.a. Sd, Pyr	a.a.
2020	90 10 Tr	Clst: a.a. Ls: a.a. Sd, Pyr	a.a.
2023	90 10 Tr	Clst: a.a. Ls: a.a. Sd, Pyr	a.a.
2026	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr	a.a.
2029	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr	a.a.
2032	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr	a.a.
2035	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr	a.a.
2035	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr	a.a.

WELLSITE SAMPLE DESCRIPTION			Page 7 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB: 23 meters		Geologist: O.Beyer / O.Hunnes	
Hole size: 8 1/2 "		Cut solvent: Isopropanol	Date: 04.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2038	95 5 Gdtr Gdtr	Clst: olv gry, frm, amor-sbblky, stky, aren, i/p gd tr pyr, non calc, mass Ls: lt gry – off wh, olv gry, blk, frm, sl arg, sl sdy, dom mikr Sd: qtz, pred f-med, sbang, mod srtd, all lse Pyr nods	No shows
2041	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr, Mic	a.a.
2044	Not recovered (checking gas trap)		
2047	95 5 Tr	Clst: v. aren, a.a. Ls: a.a. Sd, Pyr, Mic	a.a.
2050	20 75 5 Tr	Clst/Sh: brnsh blk – dsky yel brn, frm, blk, micromic, micropyr, microcarb Clst: v. aren, a.a. Ls: a.a. Sd, Pyr, Mic	a.a.
2053	Not recovered (checking gas trap)		
2056	30 60 10 Tr	Clst/Sh: pred a.a. Clst: v. aren, a.a. Ls: a.a. Sd, Pyr, Mic	a.a.
2059	10 85 5 Tr	Clst/Sh: pred a.a. Clst: v. aren, a.a. Ls: a.a. Sd, Pyr, Mic	a.a.
2062	Not recovered (checking gas trap)		
2065	100 Gdtr Tr	Clst: dk grnsh gry, sft, amor, slily slty, non – slily calc Ls: a.a. Sd, Pyr, Mic	a.a.
2068	Not recovered (checking gas trap)		
2071	Not recovered (checking gas trap)		
2074	Not recovered (checking gas trap)		
2077	Not recovered (checking gas trap)		
2080	95 5 Tr	Clst: sft, stky, a.a. Ls: a.a. Sd, Pyr, Mic	a.a.

WELLSITE SAMPLE DESCRIPTION			Page 7 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB:	23 meters	Geologist: O.Beyer / O.Hunnes	
Hole size:	8 1/2 "	Cut solvent: Isopropanol	Date: 04.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2083	90	Clst: dk gnsh gry, sft, stky, amor, slily slty, micromic, micropyr, microcarb, non – slily calc	No Shows
	10	Ls: lt gry – off wh, olv gry, blk, frm, sl arg, sl sdy, dom mikr	
	Tr	Sd, Pyr, Mic	
2086	90	Clst: sft, stky, a.a.	a.a.
	10	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2089	95	Clst: sft, stky, a.a.	a.a.
	5	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2092	95	Clst: sft, stky, a.a.	a.a.
	5	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2095	not recovered		
2098	not recovered		
2101	100	Clst: sft, stky, a.a.	a.a.
	Gdtr	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2104	100	Clst: a.a.	a.a.
	Gdtr	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2107	not recovered		
2110	not recovered		
2113	100	Clst: a.a.	a.a.
	Gdtr	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2116	100	Clst: a.a.	a.a.
	Gdtr	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2119	100	Clst: a.a.	a.a.
	Gdtr	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2122	100	Clst: a.a.	a.a.
	Gdtr	Ls: a.a.	
	Tr	Sd, Pyr, Mic	
2125	not recovered		

WELLSITE SAMPLE DESCRIPTION				Page 8 of 13
Country: Norway		Area: Nordland II		Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA		
RKB: 23 meters		Geologist: O.Beyer / O.Hunnes / L.Rasmussen / E.Undersrud		
Hole size: 8 1/2 "		Cut solvent: Isopropanol		Date: 04.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description		Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Shows, cavings, mud additives, etc.

2128	100	Clst: dk grnsh gry, sft, stky, amor, slily slty, micromic, micropyr, microcarb, non – slily calc Gdtr Ls: lt gry – off wh, olv gry, blk, frm, sl arg, sl sdy, dom mikr Tr Sd, Pyr, Mic	No Shows
2131	100	Clst: a.a. + tr Sh: gry, elong, hd, brt Gdtr Ls: a.a. Tr Sd, Pyr, Mic	a.a.
2134	95	Clst: a.a. Ls: a.a. Tr Sd, Pyr, Mic	a.a.
2137	100	Clst: a.a. Gdtr Ls: a.a. Tr Sd, Pyr, Mic	a.a.
2140	70 30	Sd/sst: dom clr-transl Qtz, vff, min slt, abang-sbrndd, lse-fri, arg, micromic, micropyr Clst: a.a. Gdtr Ls: a.a. Tr Pyr, Mic	Even wk-mod yel dir Fluor wk HC odour

Core description for core #1, 2140 –2164mMD see separate core description.

Core description for core #2, 2164 –2174mMD see separate core description.

2176	100	Clst: gry gn – dsky yel gn, also brn gry – olv gry, frm – mod hd, blk, sli calc	No shows
2179	90	Sltst/Sst: brn gry – olv gry, clr –transl Qtz, v f – f, sbrndd – rndd, wl srt, sft – frm, slty – v slty, mic, occ pyr, occ carb, glauc, non calc	in 10% of grains: pa yel fluor, v wk diffuse bl cut fluor.
	10	Clst: gn gry – lt gn gry, frm – mod hd, blk – sb plty, non calc	
2182	95	Sltst/Sst: a.a.	a.a.
	5	Clst: a.a.	
2185	90	Sltst/Sst: a.a.	a.a.
	10	Clst: a.a.	
2188	60	Sltst/Sst: a.a.	a.a.
	30	Ls: yel wh – lt gry, frm – mod hd, plty – blk, sli arg	
	10	Clst: a.a.	
2191	75	Sltst/Sst: a.a.	a.a.
	15	Ls: a.a.	
	10	Clst: a.a.	
2191	80	Sltst/Sst: a.a.	a.a.
	15	Ls: a.a.	
	5	Clst: a.a.	

WELLSITE SAMPLE DESCRIPTION			Page 9 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB:	23 meters	Geologist: L.Rasmussen / E.Undersrud	
Hole size:	8 1/2 "	Cut solvent: Isopropanol	Date: 08.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2194	80	Slstst/Sst: brn gry – olv gry, clr –transl Qtz, v f – f, sbrnrd – rndd, wl srt, sft – frm, slty – v slty, mic, occ pyr, occ carb, glauc, non calc	in 10% of grains: pa yel fluor, v wk diffuse bl cut fluor.
	15	Ls: yel wh – lt gry, frm – mod hd, plty – blkly, sli arg	
	5	Clst: gn gry – lt gn gry, frm – mod hd, blkly – sb plty, non calc	
2197	65	Slstst/Sst: med gry – med dk gry, occ brn gry, else a.a.	a.a.
	30	Ls: a.a.	
	5	Clst: a.a.	
2200	85	Slstst/Sst: a.a.	almost no shows
	10	Ls: a.a.	
	5	Clst: a.a.	
2203	90	Slstst/Sst: a.a.	no shows
	10	Ls: a.a.	
	Tr	Clst: a.a.	
2206	95	Slstst/Sst: a.a.	spotty pa yel fluor (<10% v wk diffuse cloudy bl cu fluor.
	5	Ls: a.a.	
	Tr	Clst: a.a.	
2209	A.A.		
2212	A.A.		
2215	95	Slstst/Sst: a.a.	a.a.
	5	Clst: a.a.	
2218	85	Slstst/Sst: a.a.	a.a.
	10	Ls: a.a.	
	5	Clst: a.a.	
2221	90	Slstst/Sst: a.a.	a.a.
	5	Ls: a.a.	
	5	Clst: a.a.	
2224	A.A.		
2227	A.A.		
2230	80	Slstst/Sst: a.a.	a.a.
	15	Ls: a.a.	
	5	Clst: a.a.	
2233	90	Slstst/Sst: also wh arg mtx (kao?), else a.a.	a.a.
	10	Ls: a.a.	
	Tr	Clst: a.a.	
2236	90	Slstst/Sst: occ med, else a.a.	a.a.
	5	Ls: a.a.	
	5	Clst: a.a.	

WELLSITE SAMPLE DESCRIPTION			Page 10 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9	Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA		
RKB: 23 meters	Geologist: L.Rasmussen / E.Undersrud		
Hole size: 8 1/2 "	Cut solvent: Isopropanol		Date: 09.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2239	80	Slstst/Sst: brn gry – olv gry, clr –transl Qtz, v f – f, occ med, sbrnrd – rndd, wl srt, sft – frm, slty – v slty, also wh arg mtx (kao?), mic, occ pyr, occ carb, glauc, non calc	spotty pa yel fluor (<10% v wk diffuse cloudy bl cu fluor.
	15	Ls: yel wh – lt gry, frm – mod hd, plty – blk, sli arg	
	5	Clst: gn gry – lt gn gry, frm – mod hd, blk – sb plty, non calc	
	Tr	Coal	
2242	85	Slstst/Sst : a.a.	a.a.
	10	Coal : blk, med hd, brit, shny	
	5	Clst: a.a.	
2245	95	Slstst/Sst : a.a.	a.a.
	5	Clst: a.a.	
	Tr	Coal, Pyr, Ls	
2248	100	Slstst/Sst: a.a.	a.a.
	Tr	Clst, Pyr, Coal	
2251	A.A.		
2254	A.A.		
2257	A.A.		
2260	A.A.		
2263	LOST		
2266	A.A.		
2269	A.A.		
2272	A.A.		
2275	A.A.		
2278	A.A.		
2281	A.A.		
2284	100	Slstst/Sst: a.a.	a.a.
	Tr	Clst, Pyr, Ls, Coal	
2287	95	Slstst/Sst: a.a.	a.a.
	5	Coal: a.a.	
	Tr	Clst, Pyr, Ls	
2290	A.A.		
2293	100	Slstst/Sst: a.a.	a.a.
	Tr	Clst, Coal	

WELLSITE SAMPLE DESCRIPTION			Page 11 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB: 23 meters		Geologist: L.Rasmussen / E.Undersrud	
Hole size: 8 1/2 "		Cut solvent: Isopropanol	Date: 09.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2296	100 Tr	Slstst/Sst: brn gry – olv gry, clr –transl Qtz, v f – f, occ med, sbrnrd – rndd, wl srt, sft – frm, slty – v slty, also wh arg mtx (kao?), mic, occ pyr, occ carb, glauc, non calc Clst, Coal, Pyr, Ls	spotty pa yel fluor (<10% v wk diffuse cloudy bl cu fluor.
2299	A.A.		
2302	100 Tr	Slstst/Sst: a.a. Clst, Coal	a.a.
2305	A.A.		
2308	A.A.		
2311	100 Tr	Slstst/Sst: a.a. Clst, Coal, Pyr	a.a.
2314	A.A.		
2317	LOST		
2320	100 Tr	Slstst/Sst: a.a. Clst, Coal, Pyr	a.a.
2323	A.A.		
2326	50 30 20 Tr	Slstst/Sst: also sbang, lse, else a.a. Clst: dk gry – lt gry, slty, sft – frm, sli calc Dol Ls: yel wh – lt gry, frm – sft, sbblky – blk, sli arg Mica, Coal, Glauc, Pyr	no shows
2329	LOST		
2332	A.A.		
2335	A.A.		
2338	A.A.		
2341	LOST		
2344	A.A.		
2347	LOST		
2350	60 25 10 5 Tr	Slstst/Sst: a.a. Clst: a.a. Dol Ls: a.a. Coal: blk, mod hd, brit, shiny, occ micropyr Mica, Glauc, Pyr	no shows

WELLSITE SAMPLE DESCRIPTION			Page 12 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB: 23 meters		Geologist: L.Rasmussen / E.Undersrud	
Hole size: 8 1/2 "		Cut solvent: Isopropanol	Date: 09.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2353	LOST		
2356	60	Slstst/Sst: brn gry – olv gry, clr –transl Qtz, v f – f, occ med, sbrnd – rnd, also sbang, partly lse, wl srt, sft – frm, slty – v slty, also wh arg mtx (kao?), mic, occ pyr, occ carb, glauc, non calc	no shows
	25	Clst: dk gry – lt gry, slty, sft – frm, sli calc	
	10	Dol Ls: yel wh – lt gry, frm – sft, sbblky – blky, sli arg	
	5	Coal: blk, mod hd, brit, shiny, occ micropyr	
	Tr	Mica, Glauc, Pyr	
2359	50	Slstst/Sst: a.a.	no shows
	30	Dol Ls: a.a	
	15	Clst: a.a.	
	5	Coal: a.a.	
	Tr	Mica, Glauc, Pyr	
2362	A.A.		
2365	45	Slstst/Sst: a.a.	a.a.
	30	Dol Ls: a.a	
	15	Clst: a.a.	
	10	Coal: a.a.	
	Tr	Mica, Glauc, Pyr	
2368	A.A.		
2371	A.A.		
2374	45	Slstst/Sst: a.a.	a.a.
	20	Dol Ls: a.a	
	15	Clst: a.a.	
	20	Coal: a.a.	
	Tr	Mica, Glauc, Pyr	
2377	50	Slstst/Sst: a.a.	a.a.
	40	Clst: a.a.	
	10	Coal: a.a.	
	Tr	Mica, Glauc, Pyr	
2380	A.A.		
2383	A.A.		
2386	90	Slstst/Sst: a.a.	a.a.
	10	Clst: a.a.	
	Tr	Mica, Glauc, Pyr, Coal	
2389	80	Slstst/Sst: a.a.	a.a.
	10	Clst: a.a.	
	10	Coal: a.a.	
	Tr	Mica, Glauc, Pyr	

WELLSITE SAMPLE DESCRIPTION			Page 13 of 13
Country: Norway		Area: Nordland II	Field: Lerke
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA	
RKB: 23 meters		Geologist: L.Rasmussen / E.Undersrud	
Hole size: 8 1/2 "		Cut solvent: Isopropanol	Date: 09.02.2003
Depth (m RKB)	Lithology (%)	Lithological Description	Remarks
		Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination	Shows, cavings, mud additives, etc.
2392	65	Slst/Sst: brn gry – olv gry, clr –transl Qtz, v f – f, occ med, sbrnrd – rndd, also sbang, partly lse, wl srtd, sft – frm, slty – v slty, also wh arg mtx (kao?), mic, occ pyr, occ carb, glauc, non calc	No shows
	30	Coal: blk, mod hd, brit, shiny, occ micropyr	
	5	Clst: dk gry – lt gry, slty, sft – frm, sli calc	
	Tr	Mica, Glauc, Pyr	
2395	55	Slst/Sst: a.a.	a.a.
	40	Coal: a.a.	
	5	Clst: a.a.	
	Tr	Mica, Glauc, Pyr	
2398	A.A.		
2400	A.A.		

TD at 2400.0mMD RKB / 2400.0mTVD RKB

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Well 6608/10-9**

Doc. No.
03D94*5880
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2003-07-02



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App E Core descriptions

CONVENTIONAL CORE DESCRIPTION

Country: Norway	Area: Nordland II	Field: Lerke
Well no: 6608/10-9	Formation: Melke sst	
Core no: 1	Interval: 2140 – 2164 m MD	Cored: 24. m Rec: 23 m 95.8 %
Core size: 4"	Geologists: O. Hunnes/ E. Undersrud	Date: 07.02.2003

Depth (mRT)	Lithology/Grain size cly slt vf f m c vc	Shows						Lithological Description <small>Rock name, mod. lith., colour, grain size, sorting, roundness, matrix, cementation, hardness, sed. struct., accessories, fossils, porosity, contamination</small>	Remarks Shows, etc.
		STAIN	FLUOR	CUT	POOR	FAIR	GOOD		
2140	M C		■	■	■			SST: lt brn, clr – trnsl qtz, vf – f, sbang, sl – mod arg, mod srtd, firm-fri, sil cmt, tr mica & carb frags, mod vis por	Strong HC odour, even bl wh-yel wh fluor, inst bl wh cut fluor
2141	M C		■	■	■			SST: mod – por vis por, gd tr mic & carb frags, else a.a.	a.a.
2142	M C		■	■	■			SST: v arg l.p, grad sdy clst, else a.a.	a.a.
2143	M C		■	■	■			SST: a.a.	a.a.
2144	M C		■	■	■			SST: vf – f, tr arg mtrsl, fri, wll srt, gd vis por, else a.a.	a.a.
2145	M C		■	■	■			SST: a.a.	Wk Hc odour, wk , ptchy fluor a.a., nil – poor cut fluor
2146	M C		■	■	■			SST: v arg grad to sdy clst, v carb, pr – nil vis por.	Strong HC odour, even bl wh-yel wh fluor, inst bl wh cut fluor
2147	M C		■	■	■			SST: v arg else a.a.	Wk Hc odour, wk , ptchy fluor a.a., nil – poor cut fluor
2148	C							CLST: dsky brn to dk brn, v sdy, fiss, v carb, occ frags of carb mtrsl, mic, sl tr pyr, non calc	a.a.
2149	M C		■	■	■			SST: vf – f, pr to nil vis por, else a.a.	Strong HC odour, even bl wh-yel wh fluor, inst bl wh cut fluor

CONVENTIONAL CORE DESCRIPTION

Country: Norway	Area: Nordland II	Field: Lerke
Well no: 6608/10-9	Formation: Melke sst	
Core no: 1	Interval: 2140 – 2164 m MD	Cored: 24. m Rec: 23 m 95.8 %
Core size: 4"	Geologists: O. Hunnes/ E. Undersrud	Date: 06.02.2003

Depth (mRT)	Lithology/Grain size cly slt vf f m c vc	Shows						Lithological Description <small>Rock name, mod. lith., colour, grain size, sorting, roundness, matrix, cementation, hardness, sed. struct., accessories, fossils, porosity, contamination</small>	Remarks Shows, etc.	
		STAIN	FLUOR	CUT	POOR	FAIR	GOOD			
2150	M C		█		█				SST: lt brn, clr – trnsl qtz, vf – f, sbang, v arg, poor srted, frm-fri, sil cmt, tr mica & carb frags, poor vis por	Wk Hc odour, wk , ptchy fluor a.a., nil – poor cut fluor
2151	M C		█	█			█		SST: pred arg as above, also laminas of vf-f, wll srt, fri sst, pr – fair vis port	Strong HC odour, even bl wh-yel wh fluor, inst bl wh cut fluor
2152	M C		█	█				█	SST: vf – f, gd vis por, else a.a.	a.a.
2153	M C		█	█			█		SST: v. arg, pr vis por, else a.a.	a.a.
2154	M C		█	█			█		SST: a.a.	a.a.
2155	M C		█	█			█		SST: vf – f, mod – sl carb, mod vis por, else a.a.	a.a.
2156	M C		█	█				█	SST: vf – f, friable, mod – gd vis por, tr carb frags, else a.a.	a.a.
2157	M C		█	█				█	SST: vf – f, friable, frm, tr mic, tr carb frags, else a.a.	a.a.
2158	M C		█	█			█		SST: v arg grad to sdy clst, else a.a.	a.a.
2159	C								CLST: dsky brn to dk brn, v sdy, fiss, v carb, occ frags of carb mtrl, mic, sl tr pyr, non calc	Wk Hc odour, wk , ptchy fluor a.a., nil – poor cut fluor

CONVENTIONAL CORE DESCRIPTION

Country: Norway	Area: Nordland II	Field: Lerke
Well no: 6608/10-9	Formation: Melke sst.	
Core no: 1	Interval: 2140 – 2164 m MD	Cored: 24. m Rec: 23 m 95.8 %
Core size: 4"	Geologists: O. Hunnes/ E. Undersrud	Date: 06.02.2003

Depth (mRT)	Lithology/Grain size cly slt vf f m c vc	Shows						Lithological Description	Remarks
		STAIN	FLUOR	CUT	POOR	FAIR	GOOD		
2160	M C	■	■	■				SST: lt brn, clr – trnsl qtz, vf – f, sbang, v arg, mod –poor srtd, firm-fri, sil cmt, tr mica & carb frags, mod –pr vis por	Wk Hc odour, wk , ptchy –even yel wh fluor, bl wh-yel wh fluor, mod bl wh cut fluor
2161	M C	■	■	■				SST: a.a., v mic	a.a.
2162	M C	■	■	■				SST: a.a.	a.a.
2163	M C	■	■	■				SST: mod arg, mod por, else a.a.	a.a.
2164	X								
2165									

cly slt vf f m c vc

CONVENTIONAL CORE DESCRIPTION

Country: Norway	Area: Nordland II	Field: Lerke
Well no: 6608/10-9	Formation: Melke sst.	
Core no: 2	Interval: 2164-2174 m MD	Cored: 10m Rec: 10.25 m 102,5 %
Core size: 4"	Geologists: L.Rasmussen/E.Undersrud	Date: 08.02.03

Depth (mRT)	Lithology/Grain size cly, slt, vf, f, m, c, vc	Shows						Lithological Description <small>Rock name, mod. lith., colour, grain size, sorting, roundness, matrix, cementation, hardness, sed. struct., accessories, fossils, porosity, contamination</small>	Remarks Shows, etc.
		STAIN	FLUOR	CUT	POOR	FAIR	GOOD		
2164	M, C		█	█				SST: Lt brn,clr-transl qtz,v f - f, sbang, sl - mod arg, mod srtd, frm-fri, sil cmt, tr.mica and carb frags, fr - pr por	wh - yel wh fluor, mod strm bl cut fluor
2165	M, C		█	█				SST : mod-por vis por	Shows: a.a.
2166	C, M		█	█				SST : v.arg I.P. grad sdy clst, else a.a.	Shows: a.a.
2167	M		█	█				SST : a.a. grd to v f sst	Shows: a.a.
2168	M		█	█				SST : a.a	Shows: a.a.
2169	C, M		█	█				SST :a.a	Shows: a.a.
2170	C, M		█	█				SST : a.a	Shows: a.a.
2171	M		█	█	█			SST : a.a	Shows: a.a.
2172	C							CLST : dsky brn - dk brn, v sdy, slty, fiss, v carb, occ frags of carb mat, mic, sl tr Pyr, non calc	
2173	M		█	█	█			SST : v f - f, slty - shly, pr - nil vis por, else a.a.	Shows: a.a.

CONVENTIONAL CORE DESCRIPTION

Country: Norway	Area: Nordland II	Field: Lerke
Well no: 6608/10-9	Formation: Melke sst.	
Core no: 2	Interval: 2164-2174 m MD	Cored: 10m Rec: 10.25 m 102,5 %
Core size: 4"	Geologists: L.Rasmussen/E.Undersrud	Date: 08.02.03

Depth (mRT)	Lithology/Grain size cly, slt, vf, f, m, c, vc	Shows						Lithological Description <small>Rock name, mod. lith., colour, grain size, sorting, roundness, matrix, cementation, hardness, sed. struct., accessories, fossils, porosity, contamination</small>	Remarks Shows, etc.
		STAIN	FLUOR	CUT	POOR	FAIR	GOOD		
2174	M.	■	■		■			SST: Lt brn,clr-transl qtz, v f – f, sbang, sl - mod arg, slty – shly, mod srtd, frm-fri, sil cmt, tr.mica and carb frags, pr - nil por	wh – yel wh fluor, mod strm bl cut fluor
2175									
2176									
2177									
2178									
2179									
2180									
2181									
2182									
2183									

cly slt vf f m c vc

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App F Sidewall core descriptions

SIDEWALL CORE DESCRIPTION					Page 1 of 4
Country: Norway		Area: Nordland II		Field: Lerke	
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA			
Hole size: 8 1/2 "		Geologist: Lars Rasmussen		R.KB: 23 meters	
Run no.: 1A		Reference log: Run 1A: PEX – HALS - HNGS		Date: 14.02.2003	
Shot no.	Depth (m RKB)	Rec. (mm)	Lithological Description		Remarks
			Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Shows, cavings, mud additives, etc.

Solvent used:
Iso-propanol

60	1712	30	Clst:	slty, med dk gry – dk gry, frm, stky, wh spks tuff Qtz, micropyr, non – slily calc	No shows
59	1732	30	Clst:	slty – v f sdy, non calc, else a.a.	a.a.
58	1739	20	Clst:	a.a.	a.a.
57	1745	25	Clst:	slty, else a.a.	a.a.
56	1756.5	37	Clst:	slty, med lt gry – med gry, frm, micropyr, non calc	a.a.
55	1778	35	Clst:	med dk gry – dk gry, frm – mod hd, slily slty, micropyr i.p., non calc	a.a.
54	1785	48	Clst:	med gry – med dk gry, frm, slily – non slty, micromic	a.a.
53	1800	48	Clst:	med dk gry – dk gry, else a.a.	a.a.
52	1810	25	Clst:	a.a.	a.a.
51	1816	45	Clst:	slty, micropyr, micromic, else a.a.	a.a.
50	1816.5	48	Clst:	med dk gry – dk gry, frm, slty, tr blk Qtz grains (v f sd), micropyr, micromic, non calc	ptchy wk bl wh fluor v wk slow – diffuse bl cut fluor, bl res fluor, HC odour
49	1822	28	Clst:	non – slily calc, else a.a.	a.a.
48	1828	45	Clst:	a.a.	a.a.
47	2048.5	27	Clst:	dk gry – gry blk, frm, micromic, micropyr, non – slily calc	No shows
46	2056	29	Clst:	gry blk – olv blk, frm, micromic, micropyr, calc	a.a.
45	2058	24	Clst:	a.a.	a.a.
44	2110	Empty			
43	2117	Lost			
42	2132.5	28	Clst:	dk gry – gry blk, frm, slily slty, micromic, slily calc, carb	sli HC odour wk bl wh direct fluor v wk diffuse bl cut fluor

SIDEWALL CORE DESCRIPTION						Page 2 of 4
Country: Norway		Area: Nordland II			Field: Lerke	
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA				
Hole size: 8 1/2 "		Geologist: Lars Rasmussen			R.KB: 23 meters	
Run no.: 1A		Reference log: Run 1A: PEX – HALS - HNGS			Date: 14.02.2003	
Shot no.	Depth (m RKB)	Rec. (mm)	Lithological Description			Remarks
			Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination			Shows, cavings, mud additives, etc.
41	2178.5	25	Sst:	oil stain, med dk gry – brn gry, clr – transl Qtz, frm, micromic, micropyr, slily calc, fr – pr vis por		sli HC odour bl wh direct fluor sl strm – cloudy bl wh cut fluor
40	2183	Lost				
39	2185.5	Lost				
38	2188.5	Lost				
37	2193.5	26	Clst:	med dk gry – dk gry, frm, slily slty, microcarb, micropyr, non calc		No shows
36	2196.5	50	Sltst/Sst:	oil stain, med dk gry – dk gry, clr – transl Qtz, frm, slily v f sdy, microcarb, micropyr, sli calc		ptchy bl wh direct fluor, v wk sl diffuse bl cut fluor
35	2198	44	Clst:	med dk gry – dk gry, frm, slily slty, microcarb, micropyr, slily calc		No shows
34	2201	Lost				
33	2202.5	40	Clst:	med dk gry – dk gry, frm, slily slty, microcarb, micropyr, slily calc		a.a.
32	2203.5	35	A.A.			
31	2205	21	Sst:	lt brn gry, clr – transl Qtz, v f – f, occ med, slty i.p., mod srtd, sbrnrd, sft – frm, calc cmt, microcarb, micropyr, micromic, fr vis por		sli HC odour bl wh direct fluor sl strm bl wh cut fluor
30	2206	25	Sltst/Sst:	v slty, v f, wl srtd, pr vis por, else a.a.		sli HC odour pa yel direct fluor sl strm – diffuse bl cut fluor
29	2209.5	30	Sltst/Sst:	a.a.		a.a.
28	2213.5	21	Sltst/Sst:	a.a.		sli HC odour ptchy pa yel direct fluor, v wk diffuse bl cut fluor
27	2215.5	23	Sltst/Sst:	med gry – med dk gry, else a.a.		sli HC odour v wk ptchy pa yel direct fluor v wk diffuse bl cut fluor

SIDEWALL CORE DESCRIPTION

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Country: Norway		Area: Nordland II		Field: Lerke	
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA			
Hole size: 8 1/2 "		Geologist: Lars Rasmussen		R.KB: 23 meters	
Run no.: 1A		Reference log: Run 1A: PEX – HALS - HNGS		Date: 14.02.2003	
Shot no.	Depth (m RKB)	Rec. (mm)	Lithological Description		Remarks
			Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Shows, cavings, mud additives, etc.
26	2218.5	25	Slt/Sst: lt brn gry, clr – transl Qtz, f f sdy, wl srted, sbrndd, sft – frm, calc cmt, microcarb, arg in lam, micromic, pr vis por		only wk HC odour v wk ptchy, pa yel direct fluor, v wk diffuse bl cut fluor
25	2220.8	Lost			
24	2221.3	25	Clst: med dk gry – dk gry, frm, micromic, microcarb, occ glauc, non calc		No shows
23	2223	30	Sltst/Sst: med gry, clr – transl Qtz, v f sdy, wl srted, sbrndd – rndd, sft – frm, occ microcarb, occ arg in lam, micromic, pr vis por		sli HC odour v wk ptchy pa yel direct fluor, v wk diffuse bl cut fluor
22	2228	30	Sltst/Sst : a.a.		a.a.
21	2231.5	25	Sltst/Sst : a.a.		a.a.
20	2235.5	20	Sltst : brn gry, slily sdy, microcarb, micromic, sft – frm, slily calc		No shows
19	2239.5	22	Clst: dk gry – med dk gry, sft – frm, slily slty, micromic, microcarb, non calc		a.a.
18	2241.5	Lost			
17	2254	21	Clst: dk gry – med dk gry, sft – frm, slily slty, micromic, microcarb, non calc		a.a.
16	2255.5	20	Sst: v lt gry, clr – transl Qtz, f – med, wl srted, sbang – sbrndd, sft, slily arg, non calc		sli HC odour wk pa yel direct fluor, v wk diffuse bl cut fluor
15	2256.5	25	Sst : v lt gry, clr – transl Qtz, v f – f, wl srted, sbrndd – rndd, sft, micromic, arg in lam, non calc		no HC odour v wk ptchy pa yel direct fluor, no cut fluor (?)
14	2261.3	22	Clst: brn gry, frm, micromic, microcarb, non calc		No shows
13	2270	37	Sst : v lt gry, clr – transl Qtz, v f – f, wl srted, sbang – sbrndd, sft, micromic, occ microcarb, slily calc cmted		no HC odour v wk ptchy pa yel direct fluor, no cut fluor (?)
12	2291	Lost			
11	2295	Lost			
10	2304.5	Lost			

SIDEWALL CORE DESCRIPTION				Page 4 of 4	
Country: Norway		Area: Nordland II		Field: Lerke	
Well no: 6608/10-9		Company: Petoro AS, Norsk Hydro ASA, Norsk Agip A/S, AS Norske Shell, Statoil ASA			
Hole size: 8 1/2 "		Geologist: Lars Rasmussen		R.KB: 23 meters	
Run no.: 1A		Reference log: Run 1A: PEX – HALS - HNGS		Date: 14.02.2003	
Shot no.	Depth (m RKB)	Rec. (mm)	Lithological Description		Remarks
			Rock name, mod.lith, colour, grain size, sorting, roundness, matrix, cementation, hardness, sed.structures, accessories, fossils, porosity, contamination		Shows, cavings, mud additives, etc.
9	2317.8	21	Slstst: med gry – brn gry, frm – sft, micromic, microcarb, non – slily calc		No shows
8	2319	Lost			
7	2320	20	Clst: med dk gry – dk gry, sft, non calc		a.a.
6	2329	26	Sst: v lt gry, clr – transl Qtz, v f – f, wl srted, sbang – sbrnidd, sft, micromic, occ microcarb, slily calc cmtd		a.a.
5	2335	Lost			
4	2347.8	24	Slstst/Sst: med gry – brn gry, sft – frm, micromic, microcarb, non – slily calc		a.a.
3	2353.3	20	Slstst: med dk gry – brn gry, frm, micromic, microcarb, non – slily calc		a.a.
2	2362.5	23	Clst: med dk gry – dk gry, frm, micromic, microcarb, non calc		a.a.
1	2370	19	Slstst: med dk gry – dk gry, sft, micromic, microcarb, non calc		a.a.

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App G NPD standard sheet for reporting shallow gas

1.1 NPD standard form for reporting shallow gas

WELL DATA: 6608/10-9

- | | | |
|-----|---|-----------------------|
| 1. | Distance from drillfloor to sealevel: | 23 m |
| 2. | Water depth (MSL): | 377 m |
| 3a. | Setting depth for conductor (m RKB): | 458.5 m |
| 3b. | Leak Off/Formation Integrity Test (g/cc). | N/A |
| 4a. | Setting depth for casing on which BOP is installed: | 1305 m |
| 4b. | Leak Off/Formation Integrity Test (g/cc): | 1.72 g/cc |
| 5. | Depth (m TVD RKB) and two-way time to formation/section/layer tops: | |
| | Seabed | 400.0 m / 0.484 sec. |
| | Base Qaternary/ Top Naust Formation: | 698.0 m / 0.806 sec |
| | Top Kai Formation: | 1384.5 m / 1.366 sec. |
| | Top Brygge Formation: | 1516.5 m / 1.478 sec. |

6. Depth interval (m RKB & TWT) and age of sandlayers shallower than 1000 m below seabed. State which layers if any contain gas:

The well was classified as class 0 - no shallow gas expected. The section was drilled with sea water down to 1311 mMD. No shallow gas was observed.

The 17 1/2" section (458.5 - 1311 m) was logged with MWD gamma ray and resistivity. This section is from the MWD log interpreted to predominantly consist of clays, in parts sandy clays. Water wet sand layers were observed at:

498.5 – 501.5 m
514.0 – 519.0 m
538.0 – 541.0 m
586.0 – 589.5 m
672.0 – 690.0 m

7. How was presence of gas proven:

No shallow gas observed.

8. Composition and origin of gas:

N/A.

9. Describe all measurements performed in gas bearing layers:

Used realtime/memory MWD including gamma ray and resistivity sensors.

10. Indicate the depths (m RKB & TWT) of unconformities in the well bore:

Base Quaternary is interpreted to be at: 698 mTVD RKB/ 0.806 s.

Base Tertiary is interpreted to be at: 1779.5 mTVD RKB/ 1.725 s.

11. Indicate depth and extension of sand layers (communication, continuity, truncation etc.): Water wet sand layers and sandy intervals are present between 498.5 – 690 m TVD RKB. The sand layers have good continuity and can be correlated to the 6608/10-6 and 6608/10-8 wells, which are 1.6 km and 1.9 km away.

12. Indicate depth and extension of any gas blanking, seismic anomalies etc:

- No gas blanking or seismic anomalies observed.

13. State possible seismic indications that the gas originates from deeper levels.

Description if gas originates from deeper levels: N/A

14. How does the interpretation of the site survey correspond with well data with respect to:

- **shallow gas:** No shallow gas was predicted . No shallow gas was observed.

- **sandlayers:** The interpretation of sandlayers corresponds well with the observed sandlayers.

- **unconformities:** Base Quaternary was predicted at 715 m. Base Quaternary is interpreted to be at 698 m. Base Cretaceous was predicted at 1797 m. Base Cretaceous is interpreted to be at 1779.5 m. The interpretation of the site survey corresponds very well with the well data.

- **correlation with adjacent wells:** Naust Formation, Kai Formation and Brygge Formation has a good correlation with the reference wells.

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App H Listing of other reports

List of additional available reports

Fugro Survey AS	<ul style="list-style-type: none">- Site survey at Location 6608/10-G-Lerke, Vol.1- Site survey at Location 6608/10-G-Lerke, Vol.2
Statoil	<ul style="list-style-type: none">- Well programme, PL128, Well 6608/10-9- Temporary P&A Programme Well 6608/10-9, PL128- Transient test analysis of MDT dual packer, 6608/10-9
Thales Survey	<ul style="list-style-type: none">- Navigation and positioning "Deepsea Bergen at 6608/10-9.
Kirk	<ul style="list-style-type: none">- A Report on Core Preservation and Handling on Well 6608/10-9.
Corpro Lab A/S	<ul style="list-style-type: none">- Core Photographs, Core # 1-2, Well 6608/10-9- Conventional Core Analysis Well:6608/10-9 Field: Lerke, Including: Water Saturation- CT-SCANS of seal peels, Well 6608/10-9- Digital photographs of thin sections, well 6608/10-9
Halliburton Sperry Sun	<ul style="list-style-type: none">- End of Well Report, Surface Logging Data, Mudlogging
Baker Hughes Inteq	<ul style="list-style-type: none">- End of Well Report, MWD data
Halliburton Security DBS	<ul style="list-style-type: none">- Kjerneboringsrapport 6608/10-9
Petrotech	<ul style="list-style-type: none">- Validity Check and Analysis of MDT Samples
Core Lab	<ul style="list-style-type: none">- Reservoir Fluid Study, 6608/10-9
GeoStrat	<ul style="list-style-type: none">- Well 6608/10-9, Biostratigraphy of the Interval 1320-2400m
Read well services	<ul style="list-style-type: none">- Zero Offset VSP

7 Enclosures

Composite log

Formation evaluation log

Pressure evaluation log

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